MINERALS YEARBOOK

1964

Volume IV of Four Volumes

AREA REPORTS:

International

U.S. DEPARTMENT OF THE INTERIOR

March 3, 1849

Prepared by staff of the

BUREAU OF MINES

UNITED STATES DEPARTMENT OF THE INTERIOR • Stewart L. Udall, Secretary

BUREAU OF MINES • Walter R. Hibbard, Jr., Director

Created in 1849, the Department of the Interior—a Department of Conservation—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1966

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 - Price $5 (cloth)

FOREWORD

The 1964 MINERALS YEARBOOK is the second annual review to be presented in four volumes, the fourth volume portraying international mineral industry events on a country-by-country basis. The general content of the four-volume edition follows:

Volume I, Metals and Minerals (Except Fuels), contains chapters on metal and nonmetal mineral commodities except mineral fuels. In addition, it includes a chapter reviewing these mineral industries, a statistical summary, and chapters on mining and metallurgical technology, employment and injuries, and technologic trends.

Volume II, Mineral Fuels, contains a chapter on each mineral fuel and on such related products as helium, carbon black, peat, coke and coal chemicals, and natural gas liquids. Also included are data on employment and injuries in the fuel industries and a mineral-fuels review summarizing recent economic and technological developments.

Volume III, Area Reports: Domestic, contains chapters covering each of the 50 States, the U.S. island possessions in the Pacific Ocean, the Commonwealth of Puerto Rico, the U.S. island possessions in the Caribbean Sea, and the Canal Zone. Volume III also has a statistical summary chapter, identical with that in Volume I, and a chapter on employment and injuries.

Volume IV, Area Reports: International, contains chapters presenting the latest available mineral statistics for more than 130 foreign countries and areas. The summary chapter, Minerals in the World Economy, included in the 1963 volume was not included in the 1964 volume owing to the absence of major changes in the world mineral industry economic picture, but a similar chapter is planned for the 1965 edition. Instead, 8 chapters summarizing mineral industry activities in each major continental area have been included in the 1964 edition. In its first year—1963—the international review volume presented considerable background information on the mineral resources of individual countries, which has been omitted from the 1964 issue. Thus the length of Volume IV has been greatly reduced.

The Bureau of Mines' continuous effort to enhance the Yearbook's value to its wide readership can be aided by constructive comments and suggestions of its users. Such comment is particularly invited during the formative years of the new International review volume.

WALTER R. HIBBARD, JR., *Director*

ACKNOWLEDGMENTS

The Bureau of Mines acknowledges the assistance in the preparation of this volume of many foreign mineral agencies and of the official publications on statistical data and other subjects issued in various countries. Many useful data were obtained from publications of the United Nations and from technical publications originating in the United States and many other countries. Information obtained from dispatches from the Embassies of the Department of State the world over is also acknowledged. Particularly useful were routine and special reports received from technical, mineral, and petroleum attachés who usually report on several countries in their respective areas. The attaché services comprise:

- Burton E. Ashley, Attaché, Minerals Officer, Canberra, Australia.
- W. Charles Bridgett, Attaché, Petroleum Officer, Caracas, Venezuela.
- John Burgess, Jr., Attaché, Minerals Officer, Lima, Peru.
- Donald F. Campbell, Attaché, Minerals Officer, La Paz, Bolivia.
- Bryan R. Frisbie, Attaché, Minerals Officer, New Delhi, India.
- William F. Keyes, Consul, Johannesburg, Republic of South Africa.
- Edgar L. McGinnis, First Secretary, Petroleum Officer, London, United Kingdom.
- Charles D. Mueller, Second Secretary, Consul, Minerals Officer, Mexico D. F., Mexico.
- Roderick G. Murchison, Jr., Minerals Attaché, Accra, Ghana.
- Martin Prochnik, Second Secretary, Minerals Officer, Santiago, Chile.
- Alfred L. Ransome, Attaché, Minerals Officer, Rio de Janeiro, Brazil.
- Clarence A. Wendel, Attaché, Minerals Officer, Ankara, Turkey.
- Dawson S. Wilson, Second Secretary, Minerals Officer, Manila, Philippines.

Basic data on production and trade of minerals commodities appearing in country chapters where in a number of cases supplied by the International Statistics Staff, supervised by Berenice B. Mitchell.

The individual chapters of this volume were prepared by the staff of the Division of International Activities with contributions from Eric Ho, a Brookings Institution Public Affairs Fellow on training with the Bureau of Mines, and from various members of the Foreign Service. These chapters were coordinated and reviewed by Arthur P. Nelson and Charles L. Kimbell. The correlation and final checking of the volume were performed in the Division of Minerals, and this assistance, particularly that of Paul F. Yopes and Kathleen J. D'Amico, is gratefully acknowledged.

The regimes of some of the countries and areas reviewed in this volume are not recognized by the U.S. Government. The information contained herein is technical and statistical and is not to be construed as conflicting with or contradicting U.S. policies toward these countries.

VIRGIL L. BARR,
Chief, Division of International Activities.

CONTENTS

Page
Foreword, by Walter R. Hibbard, Jr III
Acknowledgments, by Virgil L. Barr V
Regional Mineral Industry Review of North Amercia, by Lester G. Morrell 1

The Mineral Industry of—

Canada, by Lester G. Morrell 7
Greenland, by Lester G. Morrell 33
Regional Mineral Industry Review of Latin America, by Sumner M. Anderson 37

The Mineral Industry of—

Mexico, by Hazel B. Comstock and Sumner M. Anderson 49
Central American Areas, by Frank E. Noe 65
The Islands of the Caribbean, by Frank E. Noe, Sumner M. Anderson, and Benjamin H. Lim 103
Argentina, by Charles L. Kimbell 149
Bolivia, by Frank E. Noe 165
Brazil, by Garn A. Rynearson 181
British Guiana, by Garn A. Rynearson 203
Chile, by Sumner M. Anderson 211
Colombia, by Frank E. Noe 241
Peru, by John Burgess, Sumner M. Anderson, and Hazel B. Comstock 259
Surinam, by Garn A. Rynearson 275
Venezuela, by Benjamin H. Lim 285
Other South American Areas, by Garn A. Rynearson and Bernadette Michalski 301
Regional Mineral Industry Review of Europe, by L. Nahai and Roman V. Sondermayer 325

The Mineral Industry of—

Albania, by Bernadette Michalski 345
Austria, by Justin B. Gowen 349
Belgium, by F. L. Klinger 363
Bulgaria, by Bernadette Michalski 387
Czechoslovakia, by Bernadette Michalski 395
Denmark, by Stephen C. Brown 401
Finland, by F. L. Klinger 409
France, by L. Nahai 421
Germany, East, by Roman V. Sondermayer 471
Germany, Federal Republic of, by Justin B. Gowen 477
Greece, by Roman V. Sondermayer 511
Hungary, by Roman V. Sondermayer 519
Ireland, by Stephen C. Brown 527
Italy, by F. L. Klinger 635
Luxembourg, by Justin B. Gowen 567
Netherlands, by Stephen C. Brown 575
Norway, by J. M. West 595
Poland, by Bernadette Michalski 611
Portugal, by Stephen C. Brown 621
Rumania, by Roman V. Sondermayer 631
Spain, by Stephen C. Brown 639
Sweden, by Charles D. Hoyt 659
Switzerland, by Stephen C. Brown 675
U.S.S.R., by Roman V. Sondermayer 687
United Kingdom, by Justin B. Gowen 713
Yugoslavia, by Roman V. Sondermayer 735

Page
Regional Mineral Industry Review of Africa, by Thomas C. Denton and William C. Henkes ---------- 747
The Mineral Industry of—
Algeria, by William C. Henkes ---------- 759
Angola, Mozambique, and Portuguese Guinea, by William C. Henkes ---------- 767
Basutolana, Bechuanaland, and Swaziland, by Charles L. Kimbell ---------- 781
Congo, Republic of the (Léopoldville), by William C. Henkes ---------- 787
Ethiopia, by E. Shekarchi ---------- 797
Gabon, by James A. West ---------- 803
Ghana, by William C. Henkes and Eric Ho ---------- 809
Guinea, by Benjamin H. Lim ---------- 817
Ivory Coast, by Benjamin H. Lim ---------- 823
Kenya, Tanzania, and Uganda, by Thomas C. Denton ---------- 829
Liberia, by Benjamin H. Lim ---------- 845
Libya, by William C. Henkes ---------- 853
Malagasy Republic, by Arthur P. Nelson ---------- 859
Morocco, by Arthur P. Nelson and Walter A. Hayden ---------- 867
Nigeria, by William C. Henkes ---------- 879
Rhodesia (Southern Rhodesia), Zambia, and Malawi, by Thomas C. Denton ---------- 887
Senegal, by William C. Henkes ---------- 907
Sierra Leone, by Eric Ho ---------- 911
South Africa, Republic of, by Thomas C. Denton ---------- 917
South-West Africa, by Charles L. Kimbell ---------- 943
Sudan, Republic of the, by E. Shekarchi ---------- 955
Tunisia, by William C. Henkes ---------- 961
United Arab Republic (Egypt), by William C. Henkes ---------- 969
Other Areas of Africa, by Charles L. Kimbell ---------- 979
Regional Mineral Industry Review of the Near East, by James A. West ---------- 1023
The Mineral Industry of—
Bahrain, by James A. West ---------- 1027
Cyprus, by E. Shekarchi ---------- 1031
Iran, by E. Shekarchi ---------- 1035
Iraq, by James A. West ---------- 1045
Israel, by E. Shekarchi ---------- 1051
Jordan, by E. Shekarchi ---------- 1057
Kuwait, by James A. West ---------- 1061
Kuwait-Saudi Arabia Neutral Zone, by James A. West ---------- 1067
Saudi Arabia, by James A. West ---------- 1071
Syrian Arab Republic, by E. Shekarchi ---------- 1077
Turkey, by E. Shekarchi and C. A. Wendel ---------- 1083
Other Arabian Peninsula Areas, by James A. West ---------- 1099
Regional Mineral Industry Review of South Asia, by James A. West ---------- 1109
The Mineral Industry of—
Afghanistan, by James A. West ---------- 1111
Ceylon, by E. Shekarchi ---------- 1115
India, by James A. West ---------- 1121
Pakistan, by E. Shekarchi ---------- 1139
Regional Mineral Industry Review of the Far East, by K. P. Wang and J. M. West ---------- 1149
The Mineral Industry of—
Burma, by J. M. West ---------- 1159
China (mainland), by K. P. Wang ---------- 1165
Indonesia, by J. M. West ---------- 1181
Japan, by K. P. Wang ---------- 1189
Korea, North, by J. M. West ---------- 1213
Korea, South, by J. M. West ---------- 1221
Malaysia, by J. M. West ---------- 1231
Mongolia, by K. P. Wang ---------- 1243
Philippines, by J. M. West ---------- 1247
Taiwan, by Benjamin H. Lim ---------- 1257
Thailand, by J. M. West ---------- 1269
Other Far East Areas, by Benjamin H. Lim and K. P. Wang ---------- 1279

Page
Regional Mineral Industry Review of the South Pacific, by Lester G. Morrell 1297
The Mineral Industry of—
Australia, by Lester G. Morrell 1303
New Zealand, by Lester G. Morrell 1327
Other South Pacific Islands, by Lester G. Morrell 1337
Index 1347

Regional Mineral Industry Review of North America[1]

By Lester G. Morrell[2]

◆

THE WORLDWIDE economic expansion that has characterized the first 3 years of the 1960's continued through 1964 and was reflected in North America by strength in the industrial economy of the United States, which again was dominant. Advances in production were recorded in virtually all industries, including the mineral industry; 1964 mineral production established a new high, 5.4 percent above the previous peak recorded in 1963. However, the percentage increase in value of North American mineral production was slightly below overall economic growth. For industry in general, consumer demand held firm throughout the year and overall commodity prices averaged 2 percent higher than in 1963. Wages and salary payments also were up. With the single exception of the dock strike in the United States, the year was free of serious labor troubles and unemployment in both Canada and the States was at a low level. Despite the Viet-Nam situation, relatively tranquil international relations contributed to the forward movement of North American business. Total gross national product (GNP) for Canada and United States, in current dollars, was estimated at US$672.2 billion; 6.8 percent above the previous year's figure. Combined national income in 1964 amounted to US$546.9 billion, which was nearly 7.0 percent more than in 1963.

In 1964, gains were recorded in each of more than 50 metals, nonmetals, and fuels commodities that comprise the North American output. The greatest category increase was 13 percent in metals, which was in part attributable to the 14 percent rise to a new record in value of iron and steel in United States, a 29 percent higher value of Canadian iron ore and a 57 percent rise in Canadian zinc. Despite a moderate decline in prices of iron ore and iron and steel products, generally favorable markets and rising prices for metallic ores and metals were a stimulant to the metals industry. Nonmetallic materials, with a total value in excess of US$5.25 billion were 7.3 percent higher than in 1963. High levels of highway and building construction and expanding demand for fertilizers and chemicals continued throughout the year. Noteworthy output increases were recorded for lime, magnesium chemicals, and phosphate rock in the United States, potash in Canada, and asbestos and sulfur in both countries. Mineral fuels, which normally account for well over half the total value of North America's minerals, showed a 2.7 percent gain in 1964. The items that recorded greatest increase were Canadian crude petroleum, up 9 percent, and natural gas, up nearly 22 percent over the 1963 levels.

---

[1] North America, for this purpose, embraces the Dominion of Canada, the United States including Alaska and insular possessions, and the Danish Colony of Greenland. French islands off the east coast of Canada and United States Pacific possessions, including the State of Hawaii, are insignificant in the continental mineral industry.

[2] North America-South Pacific specialist, Division of International Activities.

According to United Nations[3] data, the world index of industrial production from mines and mining in 1964 was estimated to have risen 5.7 percent over the previous year. This source gives percentage increases for selected product categories and geographic areas, as follows:

Area	Percent increase of industrial production index, 1963 to 1964			
	Metal mining and basic metals	Metal products	Nonmetallic minerals and products	Coal, petroleum, gas and their products
North America[1]	12.5	6.4	8.1	6.0
Latin America[2]	6.1	NA	8.5	4.5
Europe[3]	11.1	5.8	11.8	9.7
European Economic Community[4]	10.4	4.1	10.9	10.3
Asia[5]	16.6	20.7	12.6	11.5
U.S.S.R. and Eastern Europe[6]	8.3	9.3	8.8	9.9
Non-Communist world[7]	12.0	8.2	9.9	8.2
Total	10.6	8.2	9.1	8.8

NA Not available.

[1] Canada and United States.

[2] Central and South America and Caribbean Islands.

[3] Excluding Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and U.S.S.R.

[4] Belgium, France, Italy, Luxembourg, Netherlands, West Germany.

[5] Afghanistan, Brunei, Burma, Ceylon, Taiwan, Hong Kong, India, Indonesia, Iran, Japan, South Korea, Malaysia (excluding Sabah), Pakistan, Philippines, Singapore, Thailand, and South Viet-Nam.

[6] Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Rumania.

[7] Excluding the U.S.S.R. and countries listed in footnote 6.

In 1964, the United States or Canada led the world in production of 29 commodities. North America accounted for more than half of the non-Communist world[4] output of aluminum, cadmium, magnesium, molybdenum, nickel, uranium oxide, asbestos, mica, phosphate rock, sulfur, natural gas, and several minor minerals; and more than 30 percent of the copper, iron, lead, platinum, silver, tungsten, zinc, potash, salt, coal, and petroleum. Throughout the year no change was effected in the virtually full dependence of the area upon overseas sources for supplies of beryl, chromite, diamond, manganese ore, and tin. The principal products of the minerals industries of North America in 1963–64 are listed in table 1 together with respective quantities and percentage importance in the world supply.

Consumption of mineral and metal raw materials made gains throughout the world in 1964. While North America, especially the United States, continued to be the leading consumer of most minerals, gains in United States were generally below the world average. Of the 28 selected mineral commodities listed in table 2, North American industries in 1964 absorbed more than half of the non-Communist world's supply of tin, and over one-fourth of all but anthracite coal.

---

[3] U.N. Statistical Office, Monthly Bulletin of Statistics, New York, September 1965, 217 pp.

[4] Excludes Albania, Bulgaria, mainland China, Cuba, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Rumania, U.S.S.R., North Viet-Nam, and Yugoslavia.

TABLE 1.—North American contribution to world mineral production

Commodity	1963			1964		
	Metric tons (unless otherwise specified)	Percent of— Non-Communist[1] production	Percent of— World production	Metric tons (unless otherwise specified)	Percent of— Non-Communist[1] production	Percent of— World production
Metals:						
Aluminum:						
Bauxite	1,549,171	6.7	5.1	1,626,414	6.2	4.8
Metal	2,750,495	64.6	49.9	3,080,227	64.1	50.5
Antimony	1,312	4.6	2.3	1,352	3.8	2.2
Beryl	681	11.9	10.2	NA		
Bismuth	163	6.1	5.3	176	6.0	5.3
Cadmium metal[2]	5,654	53.8	46.1	6,014	55.6	47.4
Columbium-tantalum concentrates	1,221	24.0	24.0	1,915	38.0	38.0
Copper:						
Mine (content)	1,511,112	39.7	31.9	1,579,808	39.6	32.1
Smelter	1,520,080	37.8	30.6	1,584,791	37.1	30.4
Gold ... troy ounces	5,440,797	14.0	12.3	5,279,738	13.1	11.5
Iron:						
Ore, concentrate, etc. ... thousand tons	102,126	30.8	19.6	121,274	32.4	21.1
Pig iron ... do	72,494	38.7	25.8	85,845	39.6	27.0
Steel, ingots and castings ... do	106,549	40.0	27.6	123,564	40.1	28.3
Lead:						
Mine (content)	410,369	23.1	16.2	446,668	26.2	18.0
Smelter	541,704	30.0	21.4	590,632	32.3	22.6
Magnesium metal	76,883	68.3	52.8	80,294	67.9	53.1
Mercury ... 76-pound flasks	19,117	11.9	8.0	14,142	8.2	5.6
Molybdenum	29,866	87.6	72.3	30,338	85.9	70.9
Nickel	209,897	82.0	58.8	222,566	78.3	57.7
Platinum-group metals ... troy ounces	407,401	54.7	26.4	415,475	39.6	20.3
Selenium	634	67.5	(3)	625	65.5	(3)
Silver ... thousand troy ounces	64,840	30.7	25.9	67,316	32.1	27.0
Tellurium	126	87.4	(3)	102	80.5	(3)
Tin metal ... long tons	1,650	1.2	.9	5,190	3.6	2.7
Titanium concentrate:						
Ilmenite	1,150,054	58.0	(3)	1,402,371	60.0	(3)
Rutile	10,809	5.4	(3)	7,314	3.8	(3)
Tungsten concentrate (60 percent WO_3)	5,132	24.3	8.7	8,386	35.9	14.3
Uranium oxide (U_3O_8)	20,474	72.7	(3)	17,019	73.3	(3)
Vanadium, in ore and concentrate	3,495	53.9	(3)	3,957	57.3	(3)
Zinc:						
Mine (content)	931,161	33.9	25.5	1,183,686	38.6	29.7
Smelter	1,067,392	41.6	30.7	1,171,906	42.5	31.9
Nonmetals:						
Asbestos	1,218,347	69.2	41.7	1,376,869	70.6	42.6
Barite	885,960	37.2	30.6	897,310	35.4	29.3
Cement[4] ... thousand tons	69,196	24.5	18.4	72,904	24.0	18.0
Diatomite	438,173	36.2	28.6	437,979	35.2	28.0
Feldspar	565,574	38.6	32.9	647,819	42.0	36.0
Fluorspar	258,389	14.8	12.2	283,982	13.4	11.3
Gypsum ... thousand tons	14,824	37.3	32.7	15,475	37.7	33.1
Magnesite	478,678	12.7	5.7	NA		
Mica, all forms, including scrap	99,759	55.4	(3)	104,736	56.6	(3)
Phosphate rock ... thousand tons	20,174	52.5	39.2	23,329	53.6	39.6
Potash	3,166,872	41.6	28.8	3,410,488	41.4	28.9
Pumice, pumicite, cinder	2,375,000	17.8	(3)	2,518,760	19.4	(3)
Pyrite	1,270,253	9.3	6.4	1,184,368	8.6	5.8
Salt ... thousand tons	31,180	45.3	32.8	32,224	44.9	32.7
Sulfur, elemental	6,093,732	56.2	47.6	6,773,751	56.6	48.4
Talc, soapstone, pyrophyllite	778,912	31.0	25.7	859,189	29.7	25.2
Vermiculite	205,275	69.1	(3)	205,294	66.0	(3)
Mineral fuels:						
Coal:						
Anthracite ... thousand tons	16,572	23.5	9.1	15,589	21.2	8.3
Bituminous and lignite[5] ... do	425,964	36.0	17.2	452,088	37.1	17.6
Peat (includes agricultural)	746,000	14.2	.4	810,000	13.4	.5
Petroleum, crude. thousand 42-gallon barrels	3,011,158	38.3	31.6	3,080,489	36.3	29.8
Natural gas ... million cubic feet	15,864,088	88.8	72.4	16,910,406	91.6	73.3

NA Not available.

[1] Excludes Albania, Bulgaria, mainland China, Cuba, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Rumania, U.S.S.R., North Viet-Nam, and Yugoslavia.

[2] Includes some secondary.

[3] No data or estimates on Communist countries.

[4] Includes Puerto Rico production.

[5] Includes Greenland production.

Canada traditionally has been a principal supplier of mineral raw materials to the United States. Latin America was second in 1964, with Africa, Asia, Oceania, and Europe in decreasing order. Imports from Soviet countries were relatively insignificant. However, appreciable increases in supply of chromite from the U.S.S.R. were noted in 1964, and United States consumption of platinum-group metals apparently drew heavily on U.S.S.R. sources.

TABLE 2.—Consumption of minerals and metals in North America[1]

Commodity	1963		1964[p]	
	Quantity	Percent of non-Communist world[2] production	Quantity	Percent of non-Communist world[2] production
Metals:				
Aluminum thousand metric tons	2,882	67.7	3,112	64.7
Bauxite do	13,332	57.3	15,126	57.9
Chromite do	1,128	49.0	1,370	53.7
Copper metal do	1,828	45.4	1,967	46.1
Iron ore do	122,860	37.0	143,880	38.4
Pig iron do	70,826	37.8	83,914	38.7
Steel ingots and castings do	106,141	39.8	123,100	39.9
Lead do	1,097	60.8	1,135	62.1
Manganese ore do	1,755	26.9	2,124	30.8
Mercury[3] 76-pound flasks	77,963	48.4	82,608	48.1
Molybdenum metric tons	22,905	67.2	26,186	74.2
Nickel do	118,248	46.2	140,293	49.4
Platinum[3] thousand troy ounces	1,003	[4] 64.9	1,140	[4] 55.6
Silver do	127,575	60.4	138,500	66.0
Tin long tons	60,151	43.6	63,484	44.2
Tungsten metric tons	5,427	25.7	6,034	25.8
Uranium oxide[3] do	12,898	45.8	10,747	46.3
Zinc thousand metric tons	1,347	52.5	1,487	53.9
Nonmetals:				
Asbestos do	721	40.9	813	41.7
Cement do	73,806	26.1	78,101	25.7
Phosphate rock (P_2O_5) do	15,215	39.4	16,310	37.3
Potash (K_2O) do	2,761	36.3	3,041	36.9
Salt do	30,832	44.8	33,372	46.5
Sulfur do	7,272	67.1	7,698	64.4
Mineral fuels:				
Anthracite do	13,439	18.5	13,700	18.6
Bituminous coal do	391,078	33.0	411,405	33.8
Crude petroleum million 42-gallon barrels	3,504	44.6	3,560	41.9
Natural gas million cubic feet	14,793	82.8	16,087	87.1

[p] Preliminary. Canadian data estimated by chapter author.

[1] Reported or calculated apparent consumption.

[2] Excludes Albania, Bulgaria, mainland China, Cuba, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Rumania, U.S.S.R., North Viet-Nam, and Yugoslavia.

[3] United States consumption only.

[4] Percentage of world production. U.S. consumption exceeds free world output.

North America accounted for about 16 percent of the total value of world trade in recent years. However, a large part of the North American trade is between the United States and Canada. During 1964, for example, 53 percent of Canada's total exports went to, and 69 percent of her total imports came from, the United States. Nearly 18 percent of U.S. total exports went to Canada, while 23 percent of total imports came from Canada. As a geographic unit, North America's balance of total trade is strongly favorable. In 1964, the total value of exported merchandise exceeded that of imports by 51 percent, compared with 43 percent in 1963. Reflecting the high level of industrial activity in North America, imports in 1963 of mineral raw materials, unmanufactured metals and mineral fuels exceeded exports by 36 percent in value. Greatest shortages as gaged by value of commodities imported by the United States in 1964 were petroleum, steel products, gem and industrial diamonds, bauxite, tin, manganese ore, and copper. Absolute values summarizing North American internal and overseas trade in terms of Standard International Trade Classifications (SITC) are given in table 3.

TABLE 3.—North America trade, totals, and mineral categories

(Million U.S. dollars)

Country and group designation	Imports for consumption				Exports of domestic products				Standard International Trade Classification
	1963		1964		1963		1964		
	Total	From Canada	Total	From Canada	Total	To Canada	Total	To Canada	
United States:									
Metalliferous ores and metal scrap.	787	322	817	316	367	87	498	105	281 to 286 inclusive.
Iron and steel	659	95	783	106	514	115	674	165	671 to 679 inclusive.
Nonferrous metals	903	335	1,011	355	420	43	506	67	681 to 689 inclusive.
Crude fertilizers and crude minerals.	249	95	235	92	146	39	178	44	271, 273, 274, 275, 276.
Nonmetallic mineral manufactures N.E.S.	75	10	80	11	116	38	124	41	661, 662, 663.
Chemical elements and compounds.	170	73	254	89	182	37	219	43	513, 514, 515.
Coal, coke, briquets	6	5	16	14	482	136	474	135	321.
Petroleum and products.	1,773	243	1,873	266	446	39	419	42	331, 332.
Gas, natural and manufactured.	104	94	107	97	18	3	19	3	341.
Total minerals, metals and fuels.	4,726	1,272	5,176	1,346	2,691	537	3,111	645	
Total merchandise.	17,013	3,826	18,600	4,227	22,922	4,039	26,086	4,653	
	Total	From United States	Total	From United States	Total	To United States	Total	To United States	
Canada:									
Total minerals, metals and fuels.	1,074	477	(1)	(1)	2,087	1,258	(1)	(1)	
Total merchandise	6,066	4,111	6,928	4,777	6,289	3,484	7,488	3,951	
North America area:[2]									
Total minerals, metals and fuels.	4,051	--	(1)	--	2,983	--	(1)	--	
Total merchandise	15,142	--	16,524	--	21,688	--	24,970	--	

[1] Canadian 1964 trade details by SITC classes not available.

[2] North America data are exclusive of inter-North America trade.

Source: U.S. Department of Commerce, Bureau of Census, U.S. Imports, U.S. Exports, Dominion Bureau of Statistics, External Trade Division, Trade of Canada, United Nations Statistical Office, World Trade Annual.

The Mineral Industry of Canada

By Lester G. Morrell[1]

◆

THE US$3,180 million[2] estimated value of Canada's mineral product in 1964 represents an increase of nearly 13 percent over the previous year's US$2,822 million. The annual gain was the largest on record. While the greatest percentage increase was in metals, the relative positions of categories remained approximately the same as in 1963, with metals accounting for about half, and mineral fuels three-fifths, and nonmetals two-fifths of the remainder. Category percentages and total value of Canada's mineral production for recent years are summarized as follows:

Year	Share of total value (percent)			Total value (million U.S. dollars)
	Metal	Nonmetals	Mineral fuels	
1955	56.1	20.8	23.1	1,660
1960	56.4	20.9	22.7	2,306
1961	53.7	21.0	25.3	2,388
1962	52.6	20.0	27.4	2,637
1963	49.5	20.7	29.8	2,822
1964 [p]	50.8	20.0	29.2	3,180

[p] Preliminary.

Petroleum, Canada's most valuable single mineral, accounted for 19.6 percent of the 1964 total output value. Iron ore, 11.7 percent, came next and nickel, 11.1 percent, was in third place, followed by copper, 9.6 percent, zinc, 5.6 percent, natural gas, 5.3 percent, asbestos, 4.3 percent, gold, 4.2 percent, cement, 3.9 percent, uranium, 3.7 percent, and all others combined, 21.0 percent. While gains were recorded in most commodities, headed by US$80 million for iron ore, US$66 million for zinc, and US$55 million for crude petroleum, a few metals and nonmetals registered small declines; uranium and gold fell US$10 million and US$6 million, respectively. The value of tin, selenium, pyrite and pyrrhotite, gem stones, diatomite, and peat moss also dropped by small amounts.

Without exception, each of the 10 Canadian Provinces and 2 Territories recorded an increase in value of mineral products, compared with 1963. Quebec's output of metallic minerals in 1964 was more than US$92 million higher than in 1963. Fuels in Alberta and metallic minerals in Ontario were up US$67 million and US$59 million, respectively. The greatest percentage gain was in New Brunswick where the new No. 12 Mine of Brunswick Mining & Smelting Corp. Ltd. was primarily responsible for increasing by nearly 80 percent the value of minerals produced in the Province. As in each of the preceding 3 years, Ontario, Alberta, Quebec, Saskatchewan, and British Columbia, in that order, have been the Dominion's leading mineral areas.

---

[1] North America-South Pacific specialist, Division of International Activities.

[2] Values have been converted to US dollars from Canadian dollars at the rate of Can$1.00 equals US$0.925.

According to Dominion Bureau of Statistics estimates, the national mine production index totaled 320 in 1964, compared with 294 in 1963. (Base 1949=100). Per capita value of mineral commodity output rose from US$149.37 in 1963 to US$165.37 in 1964. Mineral products comprised 7.4 percent of the estimated US$42,900 million gross national product and 9.9 percent of the US$32,100 million net national income (at factor cost). Canada's mine payrolls exceeded the combined payrolls of agriculture, fishing, trapping, and forestry workers. Of the total US$21,660 million paid as wages and salaries to the Nation's workers, the workers of the mineral industry received over US$555 million. Products of this industry also contributed indirectly to manufacturing and construction payrolls totaling US$6,086 million and US$1,466 million, respectively. Wage rates in the mining industry as indicated by December average hourly earnings of US$2.19 were among the Nation's highest. Profits, before taxes, reported by mining, quarrying, and crude-oil-producing corporations according to the Dominion Bureau of Statistics totaled US$117 million in 1964, compared with US$98 million in 1963 and US$93 million in 1962.

Aside from new record levels of Canadian output achieved in 1964 for many mineral commodities, there were several industrial developments of historic significance. Due largely to additions from new mines in New Brunswick and Quebec, Canada became the world's leading mine producer of zinc. This position will be strengthened in 1965–66 when several expansion projects and new mines of Consolidated Mining & Smelting Co. of Canada Ltd. (COMINCO), at Pine Point, and of Texas Gulf Sulphur Co., at Timmins, come on stream. The year 1964 was the first full year of operation of the Canadian Electrolytic Zinc Ltd. refinery at Valleyfield, Quebec.

Discovery of a very large, high-grade deposit of zinc-copper-silver ore, near Timmins, Ontario, and the Texas Gulf Sulphur Co.'s plan for a 6,000-ton per day concentrator were announced early in the year. Iron ore production in 1964 exceeded 30 million metric tons, for a new Canadian record. Output of steel also established a record in 1964, and plans were announced for new facilities in Quebec, New Brunswick, and at the COMINCO works at Kimberley, British Columbia. The year's record production of molybdenum and the development of new sources at Endako and Boss Mountain in British Columbia, as well as the reopening of Canada Tungsten Mining Corp. Ltd. in the Northwest Territories were noteworthy. Canada's aluminum smelting capacity was raised 25,000 tons per year in 1964. Four-fifths of this was the first stage of expansion at Kitimat, British Columbia, that will raise that plant to about 280,000 tons annual capacity.

Among industrial minerals, production records were established for asbestos, cement, gypsum, nepheline syenite, potash, salt, sodium sulfate, and sulfur. Outstanding developments in this category during the year included several corporate mergers in the asbestos industry, major expansions and new plants for cement manufacture, and the introduction of solution mining to Canada's fabulous potash enterprise near Regina, Saskatchewan, by Kalium Chemicals Ltd.

A far reaching development of 1964 was the start on construction of the Canadian Oil Sands Ltd. US$176 million project that is scheduled to extract 45,000 barrels per day of crude oil from the Athabasca tar sands beginning in 1967. Of the several new petroleum discoveries reported in 1964, the most important, perhaps, was in the Sylvia-Hondo area near the east end of Lesser Slave Lake in central Alberta.

GOVERNMENT POLICIES AND PROGRAMS

The Department of Mines and Technical Surveys, as the coordinating agency of the Canadian minerals industry, continued in 1964 to carry out its multiple functions of direct aid to private industry, both in field and laboratory activities. The Department's annual budget of approximately US$51 million provided six technological branches with a total staff of 3,800 including professional scientists and technologists. The Geological Survey and the Mines Branch have been credited with the principal contributions to overall departmental activity. In 1964, the Survey placed 111 parties in the field, in every Province and Territory. Half the effort of these parties, as measured by costs, has been devoted to reconnaissance. In cooperation with the Provinces, the Department carried out aeromagnetic mapping of the Canadian Shield and adjacent areas in Quebec, Ontario, Manitoba, and each of the three western Provinces. Special projects of 1964 included a geochemical and heavy mineral reconnaissance in the Keno Hill Area, Yukon Territory, the start of the Grenville Project of mapping the complex geology in the vast area between Lake Huron and the Labrador coast, and studies on subsurface prospecting techniques in the Kirkland Lake area of Ontario. The Mines Branch in 1964 sponsored a Symposium on Rock Mechanics that generated wide international participation and interest. The mining research unit of the Branch was transferred from Ottawa to Elliot Lake, where the dormant uranium mines will serve as a full-scale laboratory.

Assistance grants in 1964 by the Geological Survey and Mines Branch to universities for geology, mining, and metallurgical research totaled US$138,750. In addition, the Department continued to participate in the international Upper Mantle Project, a deep-drill study of the earth's crust.

Federal assistance under the Emergency Gold Mines Assistance Act was given to all but 4 of Canada's 48 gold mines in 1964, and subvention payments to coal mines exceeded US$17 million in the 1963–64 fiscal period. Commitments to Northwest Territory and Yukon prospectors under the Prospector's Assistance Program by the Department of Northern Affairs and National Resources were fully subscribed—US$55,500—in 1964.

The Saskatchewan Government enacted legislation designed to stimulate petroleum exploration by allowing more lenient land selection and by providing a royalty-free period for new discoveries below the top of the Devonian geological horizon. Alberta announced an oil proration plan which it is hoped will increase the yield from large pools while discouraging development of marginal economic areas.

PRODUCTION

Of the nearly 60 basic crude mineral commodities that make up Canada's mineral product, quantity decreases were recorded during 1964 in fewer than a dozen. Notable percentage gains compared with 1963 were as follows: Aluminum (16 percent), columbium concentrate (57 percent), iron ore (29 percent), titanium slag (43 percent), zinc in ores and concentrate (48 percent), potash (38 percent), and natural gas (22 percent).

TABLE 1.—Canada: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Metals:					
Aluminum	691,282	601,617	626,224	652,616	764,426
Antimony [1]	749	604	876	727	779
Arsenic, white	782	190	73	85	136
Bismuth [2]	192	217	193	163	176
Cadmium [3]	1,069	616	1,182	1,123	1,270
Calcium ... kilograms	61,145	32,929	56,024	44,757	72,065
Cobalt [4]	1,618	1,443	1,579	1,372	1,450
Columbium concentrate (shipments)	------------	54	866	1,221	1,915
Copper:					
Mine (recoverable)	398,490	398,332	414,931	410,552	448,754
Smelter (refined)	378,320	368,641	347,330	343,740	370,591
Gold ... thousand troy ounces	4,629	4,474	4,178	3,972	3,811
Iron and steel:					
Iron ore ... thousand tons	19,550	18,469	24,820	27,346	35,076
Pig iron and ferroalloys ... do	4,025	4,594	4,923	5,496	6,084
Steel ignots and castings ... do	5,270	5,886	6,508	7,430	8,283
Rolled steel ... do	6,098	6,427	7,220	8,177	9,123
Lead:					
Mine, ore and concentrate, content [5]	186,562	165,612	191,706	180,518	187,205
Refined, primary	145,220	156,366	138,565	141,412	137,419
Magnesium	6,612	6,926	7,998	8,078	8,184
Molybdenum	348	350	371	378	580
Nickel [6]	194,596	211,365	210,685	199,526	211,512
Platinum and platinum-group metals ... troy ounces	483,604	418,278	470,787	357,651	374,988
Selenium ... kilograms	236,610	195,321	220,928	212,630	203,549
Silver ... thousand troy ounces	34,017	31,382	30,669	29,840	30,316
Tellurium ... kilograms	20,267	35,203	26,637	34,855	36,191
Tin, mine ... long tons	278	500	291	414	159
Titanium slag (70–72 percent TiO_2)	353,427	420,355	273,470	344,115	494,164
Uranium (U_3O_8)	11,565	8,746	7,648	7,576	6,272
Zinc:					
Ore and concentrate, content [5]	369,107	401,971	455,347	451,032	662,186
Refined, primary	236,745	243,131	254,154	257,658	306,380

See footnotes at end of table.

TABLE 1.—Canada: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Nonmetals:					
Asbestos ... thousand tons	1,015	1,065	1,103	1,158	1,285
Barite	139,971	173,638	205,567	157,398	156,411
Cement [7] ... thousand tons	5,250	5,630	6,240	6,364	7,176
Clays and products [8] ... value, thousands	Can$38,227	Can$36,983	Can$37,817	Can$38,154	Can$40,535
Diatomite	40	194	191	724	530
Feldspar (shipments)	12,575	9,532	9,066	7,809	7,815
Flourspar [e]	70,000	73,000	68,000	77,000	87,000
Gypsum and anhydrite ... thousand tons	4,620	4,590	4,677	5,402	5,782
Lime ... do	1,388	1,284	1,292	1,316	1,353
Lithium concentrate (Li_2O) [9]	93	243	227	292	476
Magnesite and brucite [e]	119,000	111,000	125,000	137,000	139,000
Mica (shipments)	772	823	546	537	546
Nepheline syenite	218,300	218,013	230,803	230,424	264,935
Potash (K_2O)	[e] 8,000	------	[e] 135,000	568,675	782,388
Pyrite and pyrrhotite	936,471	469,246	469,291	432,215	323,273
Salt ... thousand tons	3,004	2,997	3,325	3,377	3,531
Sand and gravel ... do	171,416	143,605	164,423	171,975	171,797
Sodium sulfate	194,325	227,699	223,776	233,067	299,531
Stone:					
Crushed ... thousand tons	37,268	40,131	43,140	56,840	57,725
Cut [10] ... do	182	158	182	180	NA
Sulfur [11] ... do	909	841	1,106	1,700	2,107
Talc, soapstone, and pyrophyllite (shipments)	37,771	43,650	41,876	49,215	51,845
Mineral fuels:					
Coal:					
Bituminous ... thousand tons	8,020	7,429	7,283	7,894	8,460
Lignite ... do	1,969	2,004	2,047	1,700	1,809

Coke:						
High temperature	do	3,513	3,538	3,648	3,883	3,940
Low temperature	do	40	35	10		
Fuel briquets	do	74	61	50	66	54
Natural gas	million cubic feet	522,972	655,738	946,909	1,117,425	1,363,814
Peat moss	thousand tons	169	203	216	221	222
Petroleum:						
Crude	thousand 42-gallon barrels	189,534	220,861	244,139	258,435	275,364
Gasoline, total	do	102,724	104,654	111,239	119,608	124,988
Kerosine and jet fuels	do	19,833	22,364	24,433	26,288	25,414
Distillate fuel oil	do	75,511	77,085	82,215	93,900	94,139
Residual fuel oil	do	35,387	37,349	41,071	45,312	47,635
Lubricants	do	2,121	2,164	1,699	1,838	1,816
Other products	do	27,535	35,705	29,942	23,606	27,123
Refinery fuel and loss	do	17,448	18,497	19,532	20,962	21,266
Total	do	280,559	297,818	310,131	331,514	342,381

[e] Estimate. [p] Preliminary.

[1] Antimony content of antimonial lead alloys, flue dust, and dore slag.

[2] Refined metal and bullion plus recoverable bismuth content of concentrates exported.

[3] Refined metal from domestic ores plus cadmium content of some exported ores and concentrates.

[4] All forms; excludes the cobalt in nickel sinter shipped to the United Kingdom by International Nickel Co. but includes cobalt in Falconbridge nickel-copper matte to Norway.

[5] Data for 1961–64 not strictly comparable with earlier years.

[6] Refined nickel and nickel in produced oxide and recoverable nickel in matte exported.

[7] Cement shipped or used by producers.

[8] Value including bentonite and products from common, stoneware, fire clay, and other types of clay.

[9] Spodumene concentrates.

[10] Building, ornamental, paving, and similar uses of granite, limestone, marble, slate, and sandstone.

[11] Includes sulfur from natural gas and from pyrite, pyrrhotite, and smelting of sulfide ores.

TRADE

In 1964 the total value of exported crude and semimanufactured mineral products was estimated at US$1,906 million. This amounted to 26 percent of total Canadian exports, valued by the Dominion Bureau of Statistics at US$7,488 million. Iron ore, including concentrates and pellets, was the largest single item (US$329 million), accounting for over 17 percent of exported minerals. Nonferrous metals, nickel, copper, zinc, and others, in crude and semiprocessed form, accounted for 54 percent. Fuels, dominated by crude petroleum (US$242 million) and natural gas (US$91 million), accounted for 18 percent, and nonmetallic minerals, for 9 percent of total mineral exports.

As in previous years, the great bulk of mineral exports were to the United States. This included virtually all of the iron ore, petroleum, and natural gas, and over 40 percent of the nonferrous and nonmetallic material exports.

Canada's total imports in 1964 were valued at US$6,928 million, compared with US$6,066 million the previous year.

Of the 1964 total imports, minerals and metal products, largely fully manufactured, made up 58 percent and totaled US$4,026 million. Principal categories, with corresponding values and percentage of each supplied from the United States, were as follows: Iron and its products—US$2,700 million (83 percent), nonferrous metals and their products—US$597 million (63 percent), and nonmetallic minerals and their products—US$729 million (39 percent).

TABLE 2.—Canada: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Metals:				
Aluminum:				
Alumina, Al content	3,514	2,399	4,573	United States 4,287; Colombia 250.
Scrap	27,438	39,504	29,762	United States 15,182; Italy 6,999.
Pigs, ingots, wire bars, etc.	522,723	^{r} 76,237	569,710	United States 231,038; United Kingdom 171,479.
Bars, rods, sheets, castings	20,541	11,600	16,379	United States 3,199; Venezuela 194.
Foil	420	422	344	United Kingdom 245; United States 48.
Fabricated materials, n.e.s.[1]	7,155	12,975	9,439	Italy 1,508; Nigeria 1,430.
Bismuth	173	181	NA	NA.
Cadmium	1,062	880	736	United Kingdom 516; United States 200.
Calcium kilograms	56,291	41,776	95,618	United States 61,371; Belgium-Luxembourg 7,076.
Cobalt:				
Metal	246	335	269	United States 252; United Kingdom 9.
Oxides and salts, gross weight	739	498	751	United Kingdom 726; United States 24.
Columbium concentrate [2] kilograms	684,892	852,908	880,039	United States imports only.
Copper:				
Ore and matte, metal content	86,676	84,304	94,847	Japan 59,159; United States 11,996.
Scrap, slag, sludge	7,545	^{r} 9,692	12,233	Japan 5,842; West Germany 2,342.
Refinery shapes	202,341	195,032	203,459	United Kingdom 100,151 ;United States 77,378.
Semimanufactures:				
Bars, rods, shapes, etc.	20,105	23,922	31,722	Norway 6,054; Switzerland 5,629.
Pipe and tubing	4,982	6,818	8,104	New Zealand 2,164; United Kingdom 831.
Wire and cable	415	341	769	United Kingdom 234; United States 108.
Iron and steel:				
Iron ore thousand tons	21,993	24,238	30,963	United States 25,191; United Kingdom 3,213.
Pig iron do	459	437	531	United States 375; United Kingdom 90.
Ferroalloys:				
Ferrochrome	5,989	2,640	156	United Kingdom 109; Belgium-Luxembourg 41.
Ferromanganese	123	9	3,047	All to United States.
Ferrosilicon	39,235	33,326	41,718	United Kingdom 30,278; United States 9,931.
Other (type not specified)	3,019	1,291	218	Norway 98; Brazil 98.
Steel:				
Ingots and equivalent primary forms thousand tons	240	341	401	United States 293; United Kingdom 98.
Hot and cold rolled products do	600	825	974	NA.
Lead:				
Ore and concentrate, metal content	53,973	48,766	72,900	Belgium-Luxembourg 28,220; United States 27,643.
Pigs, blocks, and shot	114,125	88,127	86,970	United Kingdom 38,115; United States 27,657.
Alloys, scrap, and metal, n.e.s.[1]	3,788	4,393	6,484	United States 4,015; Netherlands 684.
Magnesium [3]	5,961	5,380	5,781	West Germany 2,011; United Kingdom 1,950.

See footnotes at end of table.

TABLE 2.—Canada: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Metals—Continued				
Nickel:				
Ore, matte, and speiss, metal content	70,225	75,651	67,827	United Kingdom 40,277; Norway 25,345.
Oxide, metal content	10,088	13,796	32,478	United States 21,306; United Kingdom 5,888.
Ingots and other refined forms	110,415	99,024	116,420	United States 83,599; United Kingdom 23,708.
Scrap and fabricated	4,064	4,508	3,302	United States 2,757; India 102.
Platinum-group metals:				
Ore and concentrate, metal content ... troy ounces	542,985	506,782	404,891	United Kingdom 383,315; Norway 19,962.
Metals ... do	28,262	42,845	3,901	Japan 3,495; United States 275.
Selenium metal and salts, selenium content ... kilograms	147,690	202,168	182,028	United Kingdom 90,629; United States 79,017.
Silver:				
Ore and concentrate, metal content ... thousand troy ounces	8,801	8,287	9,478	United States 6,263; Belgium-Luxembourg 1,448.
Refined metal ... do	9,445	10,835	10,583	United States 10,535; Brazil 29.
Titanium slag, 70 percent TiO_2	98,423	[2] 624	[2] 36,839	United States imports only.
Uranium U_3O_8	8,385	6,946	[2] 1,667	United States imports only.
Zinc:				
Ore and concentrate, metal content	219,955	193,272	365,691	United States 171,233; Belgium-Luxembourg 84,711.
Blocks, pigs, slabs	191,167	181,441	215,981	United Kingdom 88,897; United States 71,272.
Alloys, scrap, dross, etc	4,982	5,191	7,066	United States 3,604; Belgium-Luxembourg 2,030.
Fabricated materials, n.e.s.[1]	424	1,195	1,694	United States 928; United Kingdom 627.
Nonmetals:				
Abrasives:				
Fused alumina, crude and grains	149,567	138,309	141,237	United States 125,931; United Kingdom 15,306.
Silicon carbide, crude and grains	56,940	66,138	73,536	United States 71,563; United Kingdom 1,845.
Asbestos:				
Crude	165	177	194	West Germany 87; Japan 71.
Milled fibre, all grades ... thousand tons	1,056	1,094	1,210	United States 590; United Kingdom 89.
Barite, crude	209,471	145,051	141,998	United States 129,095; Venezuela 7,416.
Bentonite, earths and clays [2]	2,999	2,817	2,730	United States imports only.
Cement, portland	198,821	247,481	270,044	United States 261,459; Ceylon 7,620.
Clay and clay products ... value, thousands	Can$7,543	Can$6,874	Can$8,135	United States Can$6,337; Chile Can$279.
Feldspar	3,355	2,977	3,072	United States 3,063; Japan 9.
Fluorspar	4	2,732	912	All to United Kingdom.
Gypsum, crude ... thousand tons	3,777	4,267	4,588	United States 4,575; Bahamas 12.
Lime	64,939	88,980	96,474	United States 93,192; British Guiana 3,175.
Limestone, crude, crushed and refuse	804,850	743,410	996,119	United States 995,721; Bermuda 293.
Nepheline syenite	175,683	184,398	205,904	United States 178,209; United Kingdom 15,298.
Potash materials [2]	70,786	512,358	759,909	United States imports only.
Salt [3]	724,000	672,000	656,538	United States 617,762.
Sand and gravel	321,244	323,074	418,631	Mainly to United States.
Silica, quartzite	141,706	43,034	132,635	All to United States.

Sodium sulfate	67,176	59,283	97,358	All to United States.
Stone, cut (granite, marble, slate, and others)....value, thousands	Can$352	Can$870	Can$1,184	United States Can$1,112; Trinidad Can$53.
Sulfur, crude and refined	362,901	744,742	1,174,423	United States 574,511; Australia 130,417.
Talc and soapstone [2]	1,952	1,905	2,143	United States imports only.
Mineral fuels:				
Coal, bituminous	810,945	956,501	1,159,483	Japan 881,144; United States 274,901.
Coke, all types	143,230	140,009	109,533	United States 91,846; Japan 12,319.
Natural gas....million cubic feet	319,566	340,953	404,143	All to United States.
Petroleum:				
Crude....thousand 42-gallon barrels	91,590	90,876	101,259	All to United States.
Refinery products:				
Gasoline, total....do	964	481	1,040	United States 578; Sweden 458.
Distillate fuel oil....do	413	529	467	West Germany 235; United States 121.
Residual fuel oil....do	1,646	1,599	1,846	All to United States.
Lubricants....do	33	65	32	United States 24; Australia 3.
Other....do	2,164	1,882	4,946	United States 4,915; United Kingdom 29.

---

[e] Estimate. [r] Revised. NA Not available. Not elsewhere specified (n.e.s.). [2]Data given are from U.S. Import Statistics.

TABLE 3.—Canada: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Metals:				
Aluminum:				
Bauxite and alumina	1,825,766	1,831,959	2,378,919	British Guiana 1,036,678; Surinam 651,651.
Cryolite	4,636	4,406	2,198	Denmark 1,946; United States 252.
Semimanufactured products ..... value, thousands	Can$16,019	Can$23,305	Can$34,508	United States Can$31,278; United Kingdom Can$2,459.
Fully manufactured products ..... do	Can$23,872	Can$21,743	Can$7,759	United States Can$3,562; United Kingdom Can$1,330.
Antimony:				
Regulus, metal content	579	470	NA	NA.
Oxide and salts, metal content	299	306	322	United Kingdom 183; United States 55.
Bismuth: Metal, residues, and salts (metal content)	31	6	NA	NA.
Chromium, chromite	65,289	45,045	18,864	United States 8,005; Philippines 5,935.
Cobalt oxides, gross weight ..... kilograms	18,568	12,833	NA	NA.
Copper:				
Scrap	412	2,952	2,207	United States 2,139; British Guiana 57.
Blocks, pigs, ingots	133	5,941	6,142	All from United States.
Bars, rods, sheet, tubing, etc.	1,242	1,519	1,340	United States 1,150; West Germany 110.
Wire	1,827	20	235	United States 200; United Kingdom 26.
Oxide and sulfate	526	578	342	United States 235; United Kingdom 98.
Iron and steel:				
Iron ore ..... thousand tons	4,224	4,909	5,317	United States 4,915; Brazil 378.
Pig iron	9,168	16,133	14,416	Finland 6,817; U.S.S.R. 4,032.
Ferroalloys:				
Ferromanganese	13,595	20,538	19,804	Rep. of South Africa 17,786; Japan 1,171.
Silicomanganese	2,473	2,136	1,582	United States 787; Norway 750.
Ferromolybdenum [1]	60	57	NA	NA.
Ferrosilicon	5,549	3,470	3,114	United States 2,456; Rep. of South Africa 508.
Ferrotungsten	130	283	78	Austria 27; United Kingdom 23.
Steel:				
Ingots and equivalent primary forms	6,506	3,828	5,807	United States 5,448; France 215.
Hot and cold rolled products	741,600	881,300	1,425,100	NA.
Lead:				
Primary and fabricated forms	586	1,668	381	United States 267; United Kingdom 113.
Lead, oxide	700	984	1,379	Mexico 649; United States 495.
Manganese ore	82,304	96,970	2,115	United States 1,673; Rep. of South Africa 442.
Mercury ..... 76-pound flasks	3,224	5,889	3,867	Spain 1,866; Italy 622.
Molybdenum molybdic oxide	149	117	224	United States 205; U.S.S.R. 17.
Nickel, unwrought and semifabricated including alloys [2]	3,799	9,954	11,438	Norway 9,221; United States 2,129.
Silver ..... thousand troy ounces	15,182	7,950	5,198	United States 5,196; United Kingdom 2.
Tin, blocks, pigs and bars ..... long tons	2,274	4,193	4,849	Malaysia 4,038; United States 497.
Titanium dioxide	11,449	3,055	11,142	United States 10,103; United Kingdom 1,016.
Tungsten, scheelite ore	1,295	293	177	United States 92; Argentina 68.

Zinc:				
Pigs, slabs, blocks, anodes	644	580	20	All from United States.
Bars, plates, sheets	694	715	2,388	United States 2,036; United Kingdom 125.
Dust and granules	806	1,062	1,674	Belgium-Luxembourg 860; United States 728.
Nonmetals:				
Barite, ground	2,201	3,474	2,908	United States 2,822; West Germany 86.
Bentonite, clay and drilling mud	13,566	NA	103,825	All from United States.
Cement, all types	24,062	28,409	29,647	United Kingdom 10,337; United States 7,135.
Clays, ground or unground ... value, thousands	Can$48,264	Can$49,640	Can$5,243	United States Can$4,370; United Kingdom Can$872.
Diamonds:				
Unset ... thousand carats	62	63	65	Belgium-Luxembourg 39; Israel 15.
Bort for drilling ... do	1,130	1,123	1,157	United States 939; United Kingdom 123.
Feldspar	1,725	2,359	----------	
Fluorspar	61,550	60,598	63,490	Mexico 53,084; United States 8,965.
Gypsum, crude	63,455	67,702	73,427	Mexico 72,121; United States 1,295.
Lime	32,762	40,180	18,862	United States 18,644; United Kingdom 138.
Magnesium compounds:				
Dolomite, calcined	2,461	2,081	13,606	All from United States.
Magnesia, dead burned	22,546	14,830	25,179	United States 17,780; Yugoslavia 5,983.
Mica, unmanufactured	1,046	788	2,422	United States 2,354; India 47.
Phosphate rock ... thousand tons	1,049	1,177	1,276	United States 1,242; Morocco 32.
Phosphate fertilizers, total	169,498	137,781	159,655	All from United States.
Potash products, fertilizers	161,202	88,664	84,254	United States 56,021; France 12,289.
Salt	233,017	r 301,715	222,495	United States 181,386; Spain 31,251.
Sand and gravel ... thousand tons	761	510	538	All from United States.
Silica sand ... do	694	714	700	United States 695; Norway 3.
Sodium sulfate, and Glauber's salt	28,824	17,688	27,994	United States 19,529; United Kingdom 8,045.
Stone, crushed, including stone refuse	664,055	680,677	95,478	United States 94,810; Italy 655.
Stone, cut (granite, marble, slate, and other) ... value, thousands	Can$3,579	Can$3,299	Can$1,218	United States Can$819; Sweden Can$169.
Sulfur, elemental	176,981	136,655	135,684	United States 135,648; France 36.
Talc	21,907	24,983	28,665	United States 27,113; Italy 1,552.
Mineral fuels:				
Coal:				
Anthracite ... thousand tons	829	769	593	United States 588; United Kingdom 5.
Bituminous ... do	10,614	11,361	13,004	All from United States.
Coke, all types ... do	531	548	686	Mostly from United States.
Natural gas ... million cubic ft	5,575	r 6,823	9,641	All from United States.
Petroleum:				
Crude ... thousand 42-gallon barrels	134,518	147,721	143,531	Venezuela 102,309; Iran 16,930.
Refinery products:				
Gasoline, total ... do	1,846	2,882	2,585	Netherlands Antilles 768; Venezuela 548.
Kerosine and jet fuel ... do	2,475	2,351	2,699	Netherlands Antilles 1,402; United Kingdom 477.
Distillate fuel oil ... do	8,354	9,345	10,244	Venezuela 4,815; Netherlands Antilles 3,430.
Residual fuel oil ... do	13,513	14,740	20,498	Netherlands Antilles 9,560; Venezuela 4,957.
Lubricants ... do	1,119	1,167	1,383	United States 1,189; Trinidad 149.
Other products ... do	3,074	3,483	2,819	United States 2,608; Venezuela 119.

r Revised. NA Not available. [1] U.S. exports to Canada. [2] Quantities of nickel in matte imported from New Caledonia not separately reported.

COMMODITY REVIEW

METALS

Aluminum.—Under the stimulus of a favorable market, output of primary aluminum passed the 750,000-metric-ton mark in 1964. About one-third of this was exported to the United States, slightly less than one-fourth went to the United Kingdom, and fabricating facilities in Canada absorbed an estimated 164,000 metric tons.

No bauxite or other ore of aluminum is mined in Canada. The principal sources of supply are the Canadian owned mines and plants in British Guiana, which produced 1,696,000 metric tons of bauxite and 300,300 tons of alumina, and Alcan Jamaica, Ltd., plants which produced 755,000 tons of alumina during the year. Most of the bauxite that Canada imported (1,588,752 tons from British Guiana, Surinam, Guinea, and the United States in 1964) was converted to alumina in the Aluminum Company of Canada Ltd. (ALCAN) works at Arvida, Quebec.

Of the six aluminum reduction plants in Canada, five were operated by ALCAN and the sixth by Canadian British Aluminium Company Ltd. (CBA). Annual capacities on December 31, 1964, were as follows:

Company and location:	*Metric tons*
Alcan:	
Arvida, Quebec	338, 000
Beauharnois, Quebec	34, 000
Shawinigan, Quebec	64, 000
Alma (Isle Maligne), Quebec	104, 000
Kitimat, British Columbia	193, 000
CBA: Baie Comeau, Quebec	95, 000
Total	828, 000

ALCAN plants produced 671,700 metric tons of primary aluminum in 1964, compared with 567,500 in 1963. The year's operation was at an average rate of 92 percent of capacity; however at yearend, with the new 18,100-ton addition at Kitimat, the average was 94 percent. The CBA smelter at Baie Comeau, Quebec, effected a 4,000 tons per year capacity increase by improving operating procedures and for the last half of 1964 was operating at over 95 percent capacity. For the fiscal year ending July 31, 1964, the CBA company reported production of 89,606 tons of ingots, compared with 83,538 for the previous year.

Recently the ALCAN company has been spending about US$4.6 million annually in research and development of the monochloride direct process of aluminum reduction. This process involves partial reduction of bauxite with carbon in an electric furnace and reaction of the aluminum carbide furnace product with aluminum trichloride vapor at about 1200° C to form aluminum monochloride gas. The gas reverts to aluminum trichloride and metallic aluminum in a condenser, and the metallic aluminum is drawn off at intervals. In 1964 construction of a large pilot installation based on this process was completed at Arvida. Tests of individual process steps were being conducted and technical personnel were being trained with a view to commencing operation possibly in 1965.

In 1964, Alcan Aluminum Corp., the new U.S. subsidiary of Aluminium Ltd., acquired control of Alroll Inc., a modern hot-rolling plant at Oswego, N.Y., the sheet fabricating plants of Cerro Aluminum Co., in Los Angeles, and Bridgeport Brass Co., at Riverside, Calif.

Nesco Aluminum Ltd. completed erection of a US$1.8 million rod mill of 22,700-metric-ton annual capacity at La Malbaie, Quebec. This is the third rod mill in Canada; the others, in Vancouver, British Columbia, and Shawinigan, Quebec, are both ALCAN owned.

Copper.—Highest prices since 1956 and a strong international market generated a high level of activity for the Canadian copper industry during 1964. Mine production rose 7 percent above the record established in 1963. The year's increase was attributable in part to the resumption of full operation, following curtailment that had been imposed throughout 1962 and 1963 at several of Canada's largest mines. In addition, six new mines, with a combined mill capacity of nearly 10,000 tons per day, commenced operation in 1964.

Refinery output of new copper was the highest since 1960, and domestic consumption of refined copper, reflecting growth of fabrication within the country, rose in 1964 to 183,454 metric tons, nearly 20 percent above the previous record set in 1963.

Forty-five mines (including three Falconbridge Nickel Mines Ltd. mines and four International Nickel Company of Canada Ltd. mines) were credited with the year's production. New sources brought to production in 1964 included:

Company	Location
Consolidated Rambler Mines, Ltd	Baie Verte, Newfoundland.
Brunswick Mining and Smelting Co. Ltd	Bathurst, New Brunswick.
Lake Dufault Mines, Ltd	Noranda, Quebec.
International Nickel Company of Canada, Ltd	Crean Hill Mine, Sudbury, Ontario.
Hudson Bay Mining and Smelting Co. Ltd	Stall Lake Mine, near Snow Lake, Manitoba.
Mt. Washington Copper Co. Ltd	Courtney, Vancouver Island, British Columbia.

Twelve prospective copper producing properties currently being developed are expected to come into operation during 1965–68. The largest of these will be the Granisle mine of Granby Mining Co. Ltd. at Babine Lake, and the Granduc Mines, Ltd., property at Unuk River, both in British Columbia. The Texas Gulf Sulphur Co. discovery of high-grade zinc-silver-copper ore in a massive sulfur body 11 miles north of Timmins, Ontario, was one of the year's outstanding mineral developments. Diamond drilling has indicated 55 million tons averaging 7.08 percent zinc, 1.33 percent copper, and 4.85 ounces of silver per ton. A 6,000-ton-per-day mill is scheduled for completion in 1966. In Newfoundland, the Whalesback mine (British Newfoundland Corp. Ltd.) at Springdale, and the Gullbridge mine (First Maritime Mining Corp. Ltd.) at Gull Pond are each expected to commence milling 1,500 tons per day in 1965.

Canada's seven copper smelters and two refineries operated at near capacity throughout 1964. A new Pierce-Smith converter, described as the world's largest (14 feet in diameter and 32 feet long), was delivered to the Noranda smelter, and the plant capacity rating was raised from 1.45 million to 1.60 million metric tons (ores, concentrates, and scrap) in 1964.

According to 1962 data, distribution of copper consumed by Canada's eight principal copper and brass fabricators was to the following categories:

	Percent
Copper, wire, and rod mill products	61
Copper, sheet, strip, bars, pipe, tube, etc	30
Brass, plate, sheet, strip, rods, bars, tube, etc	8
Miscellaneous	1
Total	100

Gold.—Canadian output of gold fell nearly 3 percent in 1964 and for the second time since 1948 totaled less than 4 million ounces. Nevertheless, Canada retained its position as the world's third largest producer, after the Republic of South Africa and the U.S.S.R.; and in the national picture, gold valued at US$133.1 million ranked fifth among Canada's most valuable metallic minerals. Two mines were closed in 1964, bringing the total number of producing lode gold mines to 48. Of these, all but four were eligible for assistance under the Emergency Gold Mining Assistance Act. The year's average price, paid by the Royal Mint, was US$34.92 per ounce.

Approximately 81.4 percent of the gold produced during 1964 was from lode mines, 17.1 percent as a byproduct of various base metals, and 1.5 percent from placer operations. Ontario with 28 gold mines and several base metal sources accounted for 56.8 percent of the total. Quebec contributed 24.3 percent from its 12 gold and several base metal mines. All other Provinces and Territories added the remaining 18.9 percent. Yukon Territory production, 56,710 ounces, was all from placer operations.

Iron Ore, Pig Iron, and Steel.—Production of iron ore increased 28 percent in 1964, establishing a new national record for the third successive year. In response to the demand of record steel output in the United States, virtually all Canadian industrial suppliers and each of the four producer-provinces shared in the increase. The two largest companies; Iron Ore Company of Canada and Quebec Cartier Mining Co. in the Labrador-Quebec region shipped 23.9 million metric tons of ore in 1964, compared with 15.6 million in 1963. Two small producers, one in British Columbia, the other in Ontario, closed during the year. Operations that were started in 1964 included the Wabush mines in Labrador, the Jones and Laughlin Steel Corp., Adams mines near Kirkland Lake, Ontario, and the byproduct magnetite operation of Coast Copper Co., Ltd. in British Columbia.

The 1.2-million-ton pellet plant at the Adams mine commenced operation in October. Completion in 1965 of Caland Ore Co. Ltd. pelletizing facilities (1 million tons per year) at Steep Rock, Ontario, and Arnaud Pellets plant (5.0 million tons) at Point Noire, Quebec, are expected to bring Canadian pellet capacity to 15.6 million metric tons a year. Total iron ore productive capacity is expected to be about 48 million tons annually by the close of 1965.

At the end of the year Canada's 15 blast furnaces (one of which was idle throughout 1964) and 10 electric furnaces had a rated total production capacity of 6.6 million metric tons per year. The nation's steelmaking facilities were estimated at 9.9 million metric tons annual capacity. During 1964 output of both pig iron and steel was held at near capacity. Quantities of principal products, compared with those of previous years, were as follows:

Product	Thousand metric tons		
	1962	1963	1964
Pig iron	4,798	5,366	5,933
Ferroalloys	125	130	151
Steel:			
Ingots	6,397	7,316	8,136
Castings	111	114	147
Total	6,508	7,430	8,283
Rolled carbon steel:			
Hot rolled	5,017	5,725	6,264
Cold rolled and coated	2,048	2,265	2,595
Rolled alloy steel	155	187	264
Total rolled products	7,220	8,177	9,123

Consumption of Canadian iron ore by the domestic steel industry increased about 10 percent in 1964. Sources of materials used in blast furnaces during recent years are summarized by the Dominion Bureau of Statistics as follows:

Material	Thousand metric tons			
	1961	1962	1963	1964
Crude iron ore:				
From Canadian mines	859	831	697	770
Imported	1,886	1,646	1,618	1,192
Sinter, pellets, etc:				
From Canadian mines	1,230	1,345	1,831	2,133
Imported	1,621	2,198	2,778	3,341
From own processing [1]	1,561	1,627	1,535	1,648
Total	7,157	7,647	8,459	9,084

[1] Domestic and imported materials processed at the iron and steel plants.

Exports of iron ore in 1964 were the heaviest on record, 27 percent more than in 1963. The great bulk of the tonnage, over 25 million tons, went to the United States. Shipments to the United Kingdom, largely pellets, also were at a relatively high level in 1964.

Plans were announced in 1964 to erect a new integrated steelworks in Quebec, under sponsorship of the Provincial Government. The project, tentatively estimated at US$208 million and to be completed in 1968, will have an initial annual capacity of 600,000 tons, using Quebec iron ore. Brunswick Mining and Smelting Corp. Ltd., also announced plans to include a 250,000-ton steel facility in the US$108 million program for base metals, chemicals, and fertilizers in New Brunswick. Expansion and additions continued through 1964 in many of the established steel mills; Algoma Steel Corporation Ltd., spent about

US$37 million in new rolling capacity at Sault Ste. Marie; Atlas Steel Company's US$44 million stainless steel plant and rolling mills at Tracy, Quebec, were near completion at the yearend; and the US$141 million expansion and modernization program for the several plants of Steel Company of Canada Ltd., were well along at the yearend.

Lead and Zinc.—Due largely to production from new mines in New Brunswick and Quebec, mine output of zinc in 1964 established a national record and Canada displaced the United States as leading world producer. Mine output of lead in 1964 was 4 percent greater than in 1963.

The first full year of operating the Canadian Electrolytic Zinc Ltd. refinery at Valleyfield, Quebec, was reflected in the year's record output of over 306,000 metric tons of refined zinc in 1964. Annual capacity of the three Canadian zinc refineries at yearend totaled 326,000 tons. (Trail, British Columbia—189,000; Flin Flon, Manitoba—72,000; Valleyfield, Quebec—65,000). All of Canada's refined lead is produced by Consolidated Mining & Smelting Co. of Canada, Ltd. (COMINCO), at Trail, British Columbia.

Of the 32 mines listed by Department of Mines and Technical Surveys as lead and zinc producers during 1963 and 1964, 18 were credited with substantial quantities of both metals. Many also produce silver, copper, and other metals. Traditionally, the COMINCO mines and metallurgical works have been Canada's principal source of both lead and zinc. In 1964, the company reported production of 137,419 metric tons of lead and 180,539 tons of zinc, compared with 144,412 and 176,137 tons, respectively, in 1963.

Exports of zinc in 1964 were 55 percent greater than in 1963; large shipments of ores and concentrates to European countries and Japan accounted for the bulk of the increase. Exports of lead were up 17 percent, with most of the increase in ores and concentrates to Belgium-Luxembourg and West Germany. On the basis of 9 months data, in 1964 domestic consumption was higher by 30 percent for zinc and 15 percent for lead, compared with that of 1963.

The principal industrial development of 1964 was the discovery early in the year of the Texas Gulf Sulphur Co. orebody in Kidd Township, Ontario. The reserve is estimated at 55 million short tons of ore averaging 7.08 percent zinc, 1.33 percent copper, and 4.85 ounces of silver per ton. This, together with the new mines in Matagami District, Quebec, and at Bathurst, New Brunswick, plus the Pine Point, Northwest Territory development, presents a particularly bright supply outlook for Canadian zinc.

Molybdenum.—Shipments of molybdenum in 1964 were more than 50 percent greater than in the previous year. The bulk of production was again from Molybdenite Corporation of Canada Ltd. near La Corne, and Gaspé Copper Mines Ltd. at Murdochville, both in Quebec. About 15 tons of contained molybdenum production was credited in 1964 to Pax International Mines Ltd. at Ryan Lake, Ontario, and 20 tons to Bethlehem Copper Corp. in British Columbia.

Preissac Molybdenite Mines Ltd. near Cadillac, Quebec, initiated production with a pilot plant, and Bethlehem Copper Corp., near Ashcroft, British Columbia, commenced byproduct recovery of molybdenite in 1964. When in full-scale operation, Preissac Molybdenite

Mines Ltd. will treat about 600 tons of ore per day. Three additional molybdenum developments scheduled to commence production in 1965 were Anglo-American Molybdenite Mining Corp. near Cadillac, Quebec (1,000 tons ore per day); Noranda Mines Ltd., Boss Mountain, British Columbia (1,000 tons per day); and Canadian Exploration Ltd., Endako, British Columbia (10,000 tons per day).

Nickel.—Canada accounted for about 55 percent of the world's mine production of nickel in 1964. The U.S.S.R. and New Caledonia, respectively second and third largest producers, contributed a total of about 34 percent.

Canadian output in 1964, valued at US$353 million, was 7 percent above that of the previous year but still a few thousand tons short of the production peaks attained in 1961–62. International Nickel Company of Canada Ltd. (INCO) operating seven mines in the Sudbury District of Ontario and the Thompson mine in northern Manitoba reported deliveries of 201,500 metric tons of nickel in various primary and semimanufactured products in 1964. The five mines of Falconbridge Nickel Mines Ltd., all in the Sudbury district, Ontario, yielded delivered products containing 35,600 tons of nickel. Sherritt Gordon Mines Ltd., with mine at Lynn Lake, Manitoba, and refinery at Fort Saskatchewan, Alberta, reported production of 12,795 tons of nickel during the year. In addition to these three large, fully integrated companies, several small operators in Quebec, Ontario, and British Columbia ship concentrates to the nickel smelters. One mine in British Columbia (Giant Mascot Mines Ltd.) exports nickel-copper concentrates to Japan.

According to reports of INCO analysts, free world consumption of nickel rose to a record 290,000 metric tons in 1964, reflecting the growth in use of stainless and other nickel alloy steels. The free world annual nickel production capacity was estimated in 1964 at about 317,000 metric tons. International Nickel Company of Canada Ltd. provides nearly two-thirds of this capability, and Canadian facilities account for over 80 percent of the total.

During 1964 several new nickel alloys were introduced commercially. Each of the three major Canadian companies are actively engaged in products and process research. Of growing significance to the nickel industry is its use as a substitute for silver coinage. In 1964 Australia, France, and the Republic of South Africa specified replacement of silver and copper-silver alloy coins with cupronickel.

Platinum-Group Metals.—Reflecting the increase in nickel production with which they are coproduced, the 1964 platinum-group metal output, valued at US$23.3 million, was about 9 percent above that of 1963. Details of Canadian production by individual metals or by producer companies are not disclosed. In past years production has consisted of approximately 46 percent platinum and 54 percent rhodium, ruthenium, and iridium. They occur in the Sudbury, Ontario, and Thompson, Manitoba, nickel-copper sulfide ores and probably in the ores treated on a toll basis by the International Nickel Co. of Canada Ltd., and Falconbridge Nickel Mines Ltd. The platinum metal content of the original ore has been estimated at 0.025 ounces per ton.

In 1964 platinum metals of Canadian origin reportedly exported in ores and concentrates to the United Kingdom amounted to 383,315 troy ounces, and to Norway, 19,962 troy ounces; both figures, however, are preliminary. These quantities may have been indicative of the content of INCO nickel refinery sludges and Falconbridge nickel-copper matte, respectively.

Silver.—About four-fifths of Canadian silver production is as a byproduct, controlled by production of other metals, chiefly lead, zinc, copper, and gold. Despite a substantial increase in most of these metals and a highly favorable market, the 1964 output of silver (all forms) was only slightly higher than in 1963, when for the first time since 1957, production of less than 30 million ounces was reported. The Canadian price for silver averaged close to Can$1.40, the price being controlled by the U.S. price of US$1.2929, which in turn is limited by the value of silver in U.S. coins. The London silver price ranged from 111.625 d to a record high of 112.250 d, and averaged, for the year, 111.923 d (equivalent to US$1.30578). Total value of Canadian output of silver in 1964 was estimated at US$40.28 million. The Province of Ontario accounted for about one-third of the total Canadian production. However, the largest single mine sources were the United Keno Hill Mines Ltd., near Mayo, Yukon Territory, and the Sullivan Mine of Consolidated Mining & Smelting Co. of Canada Ltd., at Kimberley, British Columbia.

The 1963 list of silver producers includes 8 silver-cobalt mines in the Cobalt and Gowganda districts of Ontario and 19 base metal byproduct producers, some of which operate several mines. Canada has five industry refiners in addition to the Royal Canadian Mint. These plants refine more than half of the Canadian output. The remainder is exported in ores and concentrates smelted abroad. Coinage accounted in 1963 for 74 percent of Canada's domestic usage that totaled 17.6 million ounces of silver. Exports of silver, mostly to the United States, totaled 20 million ounces in 1964. Shipments to the United States included 6.26 million ounces in ores and concentrates, most of which (5.20 million ounces) was reportedly returned to Canada during the year.

Uranium.—Canadian production of uranium oxide (U_3O_8) in 1964 was 1,304 tons less than in 1963. A part of the 1964 output went to complete the Canadian Government stockpile, which was established in June 1963. The rest of the year's production was delivered to United States and United Kingdom agencies.

Diminishing output of uranium throughout the free world has resulted from scheduled mine closures, as supply contracts have been fulfilled with the U.S. Atomic Energy Commission and United Kingdom Atomic Energy Authority. Free world stocks are considered adequate for requirements through 1975–80. The Canadian Government stockpile objective for uranium oxide (U_3O_8) was attained by June 30, 1964, and two mines, Faraday (Metal Mines Ltd.) and Milliken (Rio Algom Mines Ltd.), closed as of that date. At the end of the year only three uranium producers survived; namely, Stanrock Uranium Mines Ltd., and Denison Mines Ltd., at Elliot Lake, Ontario, and Eldorado Mining & Refining Ltd., at Beaverlodge Lake, Saskatchewan.

Despite the present world oversupply of uranium stocks, interest in future requirements and prospects continued. Resource studies were updating reserve estimates and research on flotation and bacterial leaching of uranium ores was being continued at the operating mines and in the laboratories of the Department of Mines and Technical Surveys and the British Columbia Research Council.

NONMETALS

Asbestos.—For the fifth successive year, production of asbestos established a new Canadian record. However, according to Department of Mines and Technical Surveys analysis, in 1964 the U.S.S.R. may have displaced Canada as the world's leading asbestos producer.[3]

The US$137.3 million value of Canadian output in 1964 represents an increase of 8 percent over that of the previous year. About 85 percent of Canada's chrysotile asbestos has come from a dozen or more mines on the extensive deposits east of Montreal, Quebec. The balance of output has come from a single mine in each of three other provinces; Cassiar Asbestos Corp. Ltd., in northern British Columbia, accounted for 8.0 percent of the national total; Advocate Mines Ltd. at Baie Verte, Newfoundland, for 5.5 percent; and Canadian Johns-Manville Co. Ltd. at Munro, Ontario, for 1.5 percent.

A number of corporate changes were made during the year. Asbestos Corporation Ltd. acquired the operations of Johnson's Co. Ltd. and Johnson's Asbestos Co. at Thetford and Black Lake, respectively, in Quebec. Asbestos Corp. Ltd. also took over the Asbestos Hill deposit of Murray Mining Corp. Ltd. near Deception Bay, Ungava, in far northern Quebec. Canadian Johns-Manville Co. Ltd. ceased operation at Munro but continued development of its prospect in Reeves Township, Ontario.

Potash.—On the basis of anticipated low costs of production and a notably bright market outlook, more than a score of Canadian and U.S. companies have looked upon Canada's virtually unlimited potash resource as a profitable endeavor. With a full year of operation at the Esterhazy, Saskatchewan, plant of International Minerals and Chemical Corp. (Canada) Ltd., and part-year at the solution-mining plant at Kalium Chemicals Ltd., near Regina, the Canadian potash industry made an impressive showing in 1964. However, the US$28.4 million value of output in 1964 (compared with US$20.6 million in 1963) is little more than a beginning in the future production plans for this commodity as summarized in the following tabulation:

Company	Location [1]	Scheduled production	
		Starting date	Annual capacity (million metric tons, K_2O equivalent)
International Minerals and Chemical Corp	Esterhazy	1962	1.45
Do	Gerald	1967	2.30
Potash Company of America	Saskatoon	1965	.50
Kalium Chemicals Ltd	Belle Plaine	1964	.60
Alwinsal Potash of Canada Ltd	Lanigan	1968	.91
United States Borax & Chemical Corp	Allan	1968	.91

[1] All in Saskatchewan.

---

[3] Woodrooffe, H. M., supervisor, Industrial Mineral Subdivision, Minerals Processing Division, estimates 1964 U.S.S.R. output at 1.36 million metric tons.

At the close of 1964, 24 companies held about 4 million acres in a belt extending northwesterly across south-central Saskatchewan. According to estimates of Department of Mines and Technical Surveys calculations, Canadian potash (K_2O equivalent) production capacity by 1970 could be 5 million tons per year, or about 30 percent of the anticipated world total. It is expected that Canada will become the world's leading supplier before 1970.

Sulfur.—Production of all forms of sulfur reached a new high in 1964, almost 25 percent above that of 1963. World consumption of sulfur, reflecting new and expanded industrial use, has increased substantially in recent years. The heavy demand has depleted stockpiles and resulted in rising prices that have been met in Canada by a more intensive development of the petroleum and natural gas byproduct resource. As a byproduct, the cost of recovery is relatively low, thus permitting Canadian sulfur to compete in world markets despite relatively high transportation costs. By far the greatest share of total output was byproduct elemental sulfur from sour natural gas and petroleum refining; in 1964 this source accounted for 1,461,631 tons, while sulfur derived from base metal sulfide ores amounted to 485,138 tons and that derived from pyrite and pyrrhotite, totaled 160,666 tons. Each of these quantites, except that for pyrite and pyrrhotite, was considerably higher than in 1963.

Known reserves of recoverable sulfur in natural gas were estimated as of December 1962 at 83 million tons. It has been suggested that eventually three times this amount may be recovered.[4] An additional reserve exists in the Athabasca oil sands which have been said to contain more than 300 billion barrels of oil containing about 5 percent by weight of recoverable sulfur. This amounts to about 1,000 million tons. By comparison, U.S. and Mexican reserves of sulfur in salt dome deposits, and in known reserves of petroleum, natural gas, and oil shale total about 350 million tons.[5]

During 1964, 17 sulfur recovery plants were in operation; 15 in Alberta and 1 each in Saskatchewan and British Columbia. Completion of three new plants in Alberta and one in British Columbia will bring the elemental sulfur production capacity to 2.3 million tons per year in 1965.

Exports totaling more than 1 million tons in 1964 were nearly 60 percent above the record level attained in the previous year. More than half of the exported sulfur went to the United States, but a score or more other countries received smaller amounts.

Virtually all of the sulfur in smelter gas and from pyrite and pyrrhotite goes into the manufacture of sulfuric acid or other sulfur chemicals. Elemental sulfur consumed in 1962 by domestic industries went to the following:

---

[4] Bartley, C. M. Sulfur, Preliminary Mineral Review of the Canadian Minerals Yearbook, 1963. Dept. of Mines and Tech. Surveys, Ottawa, p. 8.

[5] Ambrose, Paul M. Sulfur and Pyrites. Ch. in Mineral Facts and Problems. BuMines Bull. 630, 1965, p. 909.

	Metric tons	Percent of total
Pulp and paper	281,000	59.2
Heavy chemicals, fertilizer	181,323	38.2
Miscellaneous chemicals	7,340	1.6
Rubber	2,568	.5
Iron and steel	1,267	.3
Other	869	.2
Total	474,367	100.0

MINERAL FUELS

Coal.—In 1964, production of coal was slightly greater than in any of the previous 5 years; however, recent output has been at a very low level compared with that of the past half-century. The moderate rise in 1964 is attributed to the growing demand for coal in thermal-electric power generation, and increased exports from Alberta and British Columbia to Japan. Federal transportation subvention payments of US$16.9 million (averaging US$4.42 per ton) in the 1963–64 fiscal period were the highest since this form of aid was established in 1928. About 20 percent of this amount went to movement of 767,000 metric tons of Alberta and British Columbia coal for export to Japan. Additional assistance payments during the fiscal period included US$213,749 under the Coal Equity Act (applicable to coal used in the manufacture of iron and steel), US$1.5 million under the Atlantic Provinces Power Development Act (applicable to electric power utilities), and loans totaling US$166,500 to Nova Scotia and British Columbia mines under the Coal Production Assistance Act.

In 1964, exports of Canadian coal totaling 1,159,483 metric tons were dominated by shipment of 881,144 tons of bituminous coal to Japan. Coal imports in 1964 totaled 13.6 million tons. Over 13.0 million of this was bituminous coal from the United States destined mostly to consumers in Ontario. Imports of anthracite from the United States totaled 588,100 tons.

Domestic consumption of coal in the 1963–64 fiscal period as estimated by the Dominion Coal Board [6] totaled 22,003,000 metric tons. Breakdown of consumption by principal use categories, for recent fiscal periods (April 1 to March 31), is as follows:

Consumer	1960–61	1961–62	1962–63	1963–64
Total consumption .... thousand metric tons	20,672	20,698	21,584	22,003
Household .... percent	21.7	20.9	16.7	14.5
Industrial .... do	46.3	47.0	52.8	54.0
Railway .... do	2.5	1.9	1.4	1.2
Coke and gasworks .... do	22.3	23.8	23.2	23.8
Bunkers .... do	1.3	1.1	1.0	1.1
Colliery and waste .... do	2.0	.9	1.2	.8
Export .... do	3.9	4.4	3.7	4.6
Total .... do	100.0	100.0	100.0	100.0

---

[6] Dominion Coal Board. Sixteenth Annual Report, 1963–64. Ottawa, 1965, p. 28.

At the request of the New Brunswick Department of Lands and Mines, the Dominion Coal Board in 1964 initiated a cooperative study aimed at planning production and employment relative to coal resources, production methods, and markets. A similar advisory project was arranged in Nova Scotia by the Dominion Coal Co. Ltd. with experts from the National Coal Board of Great Britain.

Handling and transportation facilities installed during 1964 are expected to effect cost savings of up to US$1.39 per ton. The 22,000-ton self-unloading coal carrier "SS Cape Breton Miner" was put into service carrying coal from Sydney to the Toronto area. New, modern coal-loading facilities and means for turning ships have been provided at Sydney, Nova Scotia, and storage yards at Port Moody, British Columbia, have been improved.

A number of noteworthy mechanical improvements have been effected during the years. Continuous miners have been installed in the pitching seams of the Canmore and Crowsnest areas of Alberta and British Columbia. In the Sydney coalfield, Nova Scotia, a mile-long conveyor belt was installed at Dominion No. 20 Colliery, and another Wilcox Mechanical Miner was put in service at the Four Star Mine of Bras d'Or Coal Co. Ltd.

Petroleum and Natural Gas.—In 1964, production of crude petroleum averaged 754,000 barrels[7] per day; an increase of 7 percent over the 1963 rate. Production of all liquid hydrocarbons, including natural gas liquids, amounted to 856,000 barrels per day. This was nearly 9 percent more than the 1963 rate and well above the National Oil Policy goal of 850,000 barrels daily. Output of natural gas averaged 3,730 million cubic feet per day in 1964, about 22 percent above the 1963 daily average.

According to the Canadian Petroleum Association,[8] new oil discoveries accounted for 108 million barrels, and further extensions and revisions brought the yearend estimate of Canada's proved liquid hydrocarbon reserves to 7,065 million barrels. Estimated recoverable reserves of natural gas were placed at 43,391 billion cubic feet, and of sulfur, at 69.1 million long tons.

Exploratory and development drilling activities were at a new record level in 1964. Footage totaled 15,421,238 in 3,217 holes (of which 4.8 million feet in 961 holes were classified as wildcats) in 1964.[9] Approximately two-thirds of the drilling was in Alberta, slightly more than one-fourth in Saskatchewan. The most important new discovery of 1964 was the Sylvia Hondo field on Lesser Slave Lake in north-central Alberta, where an area 25 miles long by 6 miles wide has been defined by 3 dozen wells. Sun Oil Co. Ltd. and other companies have taken out exploration permits covering several million acres of oil shale lands in east-central Saskatchewan and adjacent Manitoba. Construction started in 1964 on the Canadian Oil Sands Ltd. US$176 million project to extract oil from Athabasca bituminous sands. Production at 45,000 barrels per day is scheduled to commence in the fall of 1967.

---

[7] The Canadian unit barrel, containing 35 imperial gallons, is equivalent to the U.S. barrel of 42 U.S. gallons.

[8] Canadian Petroleum Association. Monthly Report. March 1965, Calgary, Alberta, p. 1.

[9] Oil and Gas Journal. V. 63, No. 23, June 7, 1965, p. 114.

Provincial distribution and capacities of operating refineries and gas processing plants in Canada as of December 31, 1964, is summarized in the following tabulation:

Province	Oil refineries		Gas processing plants	
	Number	Capacity (thousand 42-gallon barrels per day)	Number	Capacity (million cubic feet per day)
Alberta	7	86,700	80	4,649.9
British Columbia	6	101,170	4	422.0
Manitoba	3	41,300	--------	
New Brunswick	2	45,300	--------	
Nova Scotia	2	72,000	--------	
Ontario	7	306,900	3	21.5
Quebec	6	315,700	--------	
Saskatchewan	6	69,500	7	137.5
Others	2	9,600	--------	
Total	41	1,048,170	94	5,230.9

Actual daily receipts at refineries during 1964 averaged 941,000 barrels, an increase of 3 percent compared with 1963. While the refineries in Quebec and the Maritime Provinces were dependent almost wholly on imported crude, the bulk of Canadian requirement—58 percent in 1964—was domestic oil, refined in Ontario and the western provinces. Exports of crude oil and natural gas liquids, all of which went to refineries in the United States, averaged 280,000 barrels per day in 1964, a 12 percent increase over those of 1963.

Thirty percent of Canada's natural gas was exported to the United States in 1964. Nearly half of this went through the Alberta to California pipeline. Of the domestic sales, Ontario absorbed 39 percent of the total, Alberta 31 percent.

Helium.—The only plant producing helium from natural gas in the free world outside the United States was completed in December 1963 by Canadian Helium Ltd. It is 9 miles north of Swift Current in Saskatchewan. Canadian Helium is owned equally by British American Oil Co. Ltd. (the Canadian affiliate of Gulf Oil Corp.), British Oxygen Co. Ltd. of London, and L'Air Liquide of Paris. The plant, with a designed capacity to handle 12 million cubic feet of helium per year, went on stream in the middle of 1964 and to the end of the year produced approximately 5 million cubic feet. The helium recovered at this plant comes from two wells of noncombustible gas containing 1 to 2 percent helium and about 96 percent nitrogen. Nitrogen is separated along with helium but at a rate which is four times greater than that of the helium.

Canadian reserves of helium, on the basis of preliminary estimates, indicate that the known helium-bearing structures near Swift Current and 75 miles to the south near Mankota, contain a total of 1 to 2 billion cubic feet.[10] The product has been sold to consumers in Canada and exported to Australia, the United Kingdom, and France.

---

[10] Lee, H. Helium the Space Age Gas. Dept. of Min. Resources, Petroleum and Natural Gas Branch. 1965, Regina, Sask., p. 5.

The Mineral Industry of Greenland

By Lester G. Morrell[1]

◆

SINCE suspension of cryolite mining at Ivigtut and lead-zinc mining at Mesters Vig in 1962–63, the only mineral commodities produced in Greenland have been coal, salt, and construction materials. Of these, only coal has been quantitatively reported.

Interest in mineral prospects during 1964 was largely confined to the molybdenum occurrences in the vicinity of Mesters Vig on the east coast and a geophysical research project in West Greenland.

The Arktisk Minekompagni (Arctic Mining Co.) owned jointly by Nordisk Mineselskab (Nordic Mining Co.) and American Metal Climax, Inc. was endeavoring to raise the estimated $20.7 million (300 million kroner) to proceed with plans to develop the molybdenum. The deposit has been reported to contain over 50 million tons of low-grade ore. With regard to uranium prospects, two Soviet scientists found "interesting rocks" in the Narssaq-Kvane mountain area near Godthab on the west coast.

The Greenland Ministry early in 1965 was preparing for a 2-year program of geophysical investigations covering an area of 1,900 square miles north of Umanak on the West Greenland coast. The flight operations will be performed by the Hunting Survey Corporation, Ltd. of Canada. The concession, assigned to a new Danish-Canadian company, is the first in Greenland which has granted prospecting and mining rights to unspecified minerals and metals.

Separate minerals legislation for Greenland designed to attract mining ventures was adopted by the Danish Folketing on April 28, 1965. Under the new law, permission to survey and prospect may be granted to Danish or to foreign enterprises or individuals. Exploitation privileges are restricted to companies registered in Denmark but these companies did not necessarily have to be Danish owned. License fees are not required for surveying or prospecting and concession taxes are deferred until investment has been amortized.

PRODUCTION

Coal was the only mineral product reported in 1964. Cryolite shipments were from stockpiles which in 1962 were estimated to contain from 700,000 to 800,000 metric tons. Quantities of construction materials and salt production are not recorded.

---

[1] North America-South Pacific specialist, Division of International Activities.

TABLE. 1.—Greenland: Production of metals and minerals

(Metric tons)

Commodity	1960	1961	1962	1963	1964
Metals:					
Lead concentrate:					
Gross weight	8,000	13,000	1,900	----------	----------
Metal content	6,926	9,166	808	----------	----------
Zinc concentrate:					
Gross weight	14,900	12,500	6,200	----------	----------
Metal content	10,000	8,000	4,000	----------	----------
Nonmetals:					
Cryolite, crude	[1] 42,456	[1] 41,775	[1] 40,943	----------	----------
Mineral fuels: Coal, bituminous	28,415	[r] 30,139	26,098	40,000	24,000

[r] Revised

[1] Exports.

TRADE

Although the historic cryolite deposits were worked out and the mines closed early in 1963, shipments from mine stocks totaled 58,755 tons in 1964 and are expected to continue for several years to provide the bulk of Greenland's mineral exports. At mine closure in 1963, stockpiles reportedly contained 700,000 to 800,000 tons. In 1963 minerals accounted for one-third of the total value; $10.9 million (75.6 million kroner) of Greenland's exports. Imports, made up largely of electrical and transportation items and fuels, had a total value of $25.2 million (174.0 million kroner) of which metals, minerals, and fuels comprised about 15 percent.

TABLE 2.—Greenland: Exports of metals and minerals

(Metric tons)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Lead, concentrate .... gross weight	2,327	----------	
Zinc, concentrate .... do	10,377	----------	
Nonmetals:			
Cryolite, crude [1]	40,943	67,136	Denmark 52,603; United States 14,533.
Salt	----------	30	All to Denmark.
Mineral fuels:			
Coal, bituminous	4,215	4,687	Do.

Includes quartz, mica, fluorspar, etc.

TABLE 3.—Greenland: Imports of metals and minerals

(Metric tons)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Iron and steel, semimanufactures [1]	2,287	1,898	All from Denmark.
Nonferrous metals, semimanufactures.[2]	96	103	Do.
Nonmetals:			
Bricks, stone, clay products	3,695	3,296	Do.
Cement	668	763	Do.
Expanded clays, etc	499	479	Do.
Fertilizers, processed	100	11	Do.
Lime (burned)	450	402	Do.
Salt	7,474	7,676	Spain 7,600; Denmark 76.
Other nonmetals, crude	364	156	All from Denmark.
Other nonmetals, processed [3]	3,005	3,262	Do.
Mineral fuels:			
Coal, including briquets	15,211	17,208	United Kingdom 16,489; Denmark 675.
Petroleum refinery products:			
Gasoline	2,870	2,818	Netherlands West Indies 2,431; Denmark 387.
Petroleum turpentine	2,330	3,478	Netherlands West Indies 2,775; Denmark 703.
Kerosine and diesel fuel	35,808	47,947	Netherlands West Indies 38,398; Venezuela 8,719; Netherlands 653.
Heavy fuel oil	10,144	6,822	All from Netherlands.
Other	721	1,050	All from Denmark.
Natural gas	78	136	Do.

[1] Bars, rods, plates, sheets, structural shapes, pipes, etc.

[2] Bars, plates, sheets, shapes, etc., of copper, aluminum, lead, zinc, tin, and alloys of these metals.

[3] Exclusive of glass and other ceramic materials.

Regional Mineral Industry Review of Latin America[1]

By Sumner M. Anderson [2]

◆

THE importance of the mineral industries of the Latin American area in 1964 may be evaluated in respect to a number of points of reference, a few of which are measurable and appropriate for examination. With regard to the region's contribution to total world production, it accounted for total 1964 world output of natural nitrates (from Chile), and about 97 percent of the optical and electrical grades of quartz crystal (from Brazil). The region supplied over 20 percent of world output of 7 other mineral commodities and accounted for 4 percent or more of world output of 19 other mineral products. Among major commodities, the area, occupying 15 percent of the earth's land surface, supplied within 3 percent of that proportion of the world's output of copper, lead, tin, zinc, barite, and crude petroleum.

Incomplete compilation of production data, particularly that of nonmetallic minerals, precludes production estimates on some items for the area as a whole, and therefore the importance of Latin America as a world producer of some additional commodities may not be clearly assessed. For example, most of the countries of the area collect only incomplete data or no data at all on the production of clays and other ceramic materials, sand and gravel, dimension and crushed stone, lime, ornamental and precious stones, perlite, vermiculite, carbon black, coal tar products, and petrochemicals. In the case of many countries of the area, the value of production of one or more of these commodities greatly exceeded that of other mineral industry products that are carefully reported.

Mineral production is rather widely distributed throughout the area; of the 29 countries and territorial entities comprising the region, 22 are principal producers for the area of one or more mineral commodities. The greatest diversity of mineral production is in Mexico, Brazil, Argentina, Peru, and Chile, and the mineral industry is of greatest importance to the domestic economy in Bolivia, The Netherlands Antilles, Venezuela, Trinidad and Tobago, Surinam, British Guiana, Jamaica, Chile, and Peru.

---

[1] The term Latin America embraces the Western Hemisphere south of the United States exclusive of U.S. territories and dependencies in the Caribbean. It includes in South America 10 republics and the 3 Guianas; in Middle America 7 republics and 1 British colony on the North American continent (Mexico to Panama), and all the islands, independent and otherwise, of the West Indies other than those belonging to the United States.

[2] Chief Latin America specialist, Division of International Activities (now retired).

TABLE 1.—Latin America: Approximate production of principal metals and minerals[1]

(Metric tons unless otherwise specified)

Commodity	1963			1964			
	Middle America	South America	Total	Middle America	South America	Total	Principal producing countries
Metals:							
Aluminum:							
Ore (bauxite) thousand tons	8,119	5,988	14,107	9,075	6,671	15,746	Jamaica, Surinam, British Guiana.
Alumina do	737	268	1,005	781	339	1,120	Jamaica, British Guiana, Brazil.
Metal	4,772	17,610	22,382	17,678	25,150	42,828	Brazil, Mexico, Uruguay.
Antimony:							
In ores mined	4,854	8,176	13,030	4,788	10,234	15,022	Bolivia, Mexico, Peru.
In metal and alloys	927	381	1,308	983	384	1,367	Mexico, Peru.
Arsenic trioxide	12,906	902	13,808	15,196	808	16,004	Mexico, Peru, Brazil.
Beryllium ore (beryl)	-----	2,345	2,345	-----	1,639	1,639	Brazil, Argentina, Bolivia.
Bismuth:							
In ores mined	427	819	1,246	472	1,003	1,475	Peru, Mexico, Bolivia.
In metal and alloys	NA	560	NA	NA	721	NA	Peru.
Cadmium:							
In concentrates and flue dust (recoverable)	2,946	423	3,369	2,887	535	3,422	Mexico, Peru, Honduras.
In metal and alloys	148	173	321	158	197	355	Mexico, Peru.
Total recoverable	3,094	596	3,690	3,045	732	3,777	Mexico, Peru, Honduras.
Chromite	50,600	17,100	67,700	51,000	17,000	68,000	Cuba, Brazil.
Columbium and tantalum ores	-----	4,490	4,490	-----	1,353	1,353	French Guiana, Brazil.
Copper:							
In ores mined	75,028	783,620	858,648	72,775	811,880	884,655	Chile, Peru, Mexico.
In smelter products	54,337	717,981	772,318	51,005	741,355	792,360	Do.
Gold troy ounces	455,500	850,000	1,305,500	450,000	963,500	1,413,500	Colombia, Nicaragua, Mexico.
Iron and steel:							
Iron ore thousand tons	2,335	38,743	41,078	2,329	49,893	52,222	Venezuela, Brazil, Chile, Peru.
Pig iron and sponge iron do	1,003	3,368	4,371	1,119	3,496	4,615	Brazil, Mexico, Chile.
Steel ingots and castings do	2,029	4,893	6,922	2,279	4,310	6,589	Do.
Lead:							
In ores mined	199,035	211,901	410,936	182,312	210,712	393,024	Mexico, Peru, Argentina.
In metal and alloys	186,217	121,243	307,460	157,789	128,828	286,617	Do.
Manganese ore thousand tons	248	1,455	1,703	263	1,508	1,771	Brazil, Mexico, British Guiana.
Mercury 76-pound flasks	17,202	3,813	21,015	12,560	3,577	16,137	Mexico, Peru, Chile.
Molybdenum, in sulfide concentrates	41	3,582	3,623	43	4,549	4,592	Chile, Peru, Mexico.
Nickel	16,700	1,030	17,730	17,000	1,100	18,100	Cuba, Brazil.
Platinum troy ounces	-----	22,983	22,983	-----	11,150	11,150	Colombia.

Selenium, kilograms	2,874	8,977	11,851	4,239	7,619	11,858	Peru, Mexico.
Silver, thousand troy ounces	46,500	46,515	93,015	45,569	47,000	92,569	Mexico, Peru.
Strontium ore	5,875	540	6,415	4,788	30	4,818	Mexico, Argentina.
Tellurium, kilograms	------	1,281	1,281	------	21,209	21,209	Peru.
Tin:							
In ores mined	1,056	23,657	24,713	1,275	26,284	27,559	Bolivia, Brazil, Mexico.
In metal and alloys	1,056	4,514	5,570	1,145	5,341	6,486	Do.
Titanium ores:							
Ilmenite	141	5,782	5,923	------	8,271	8,271	Brazil, Mexico.
Rutile	------	389	389	------	390	390	Brazil.
Tungsten ore, 60 percent WO_3 equivalent	33	3,413	3,446	11	3,128	3,139	Bolivia, Peru, Brazil.
Vanadium	------	3	3	------	31	31	Argentina.
Zinc:							
In ores mined	252,196	229,942	482,138	244,175	265,364	509,539	Mexico, Peru.
In metal and alloys	56,751	75,263	132,014	59,426	83,903	143,329	Do.
Zirconium ores	------	1,287	1,287	------	• 2,000	• 2,000	Brazil.
Nonmetals:							
Asbestos	------	1,648	1,648	------	1,931	1,931	Brazil, Argentina, Bolivia.
Barite	256,595	193,417	450,012	326,017	190,907	516,924	Mexico, Peru, Brazil.
Borates	------	27,196	27,196	------	20,127	20,127	Argentina, Chile.
Cement, hydraulic, thousand tons	4,266	13,758	18,024	5,033	15,206	20,239	Brazil, Mexico, Argentina.
Diamond:							
Gem stones, carats	------	273,000	273,000	------	298,000	298,000	Brazil, British Guiana, Venezuela.
Industrial, do	------	246,000	246,000	------	277,000	277,000	Brazil, Venezuela, British Guiana.
Total, do	------	519,000	519,000	------	575,000	575,000	Do.
Diatomite	3,200	13,500	16,700	3,600	13,700	17,300	Argentina, Costa Rica, Brazil.
Dolomite	NA	634,000	NA	NA	606,000	NA	Brazil, Argentina, Uruguay.
Emeralds:							
Gem stones, carats	------	51,000	51,000	------	55,000	55,000	Colombia.
Moralla, do	------	2,004,000	2,004,000	------	214,000	214,000	Do.
Total, do	------	2,055,000	2,055,000	------	269,000	269,000	Do.
Feldspar	NA	• 67,500	NA	NA	• 60,800	NA	Brazil, Colombia, Argentina.
Fluorspar	479,892	10,062	489,954	500,493	10,283	510,776	Mexico, Argentina, Brazil.
Graphite	29,996	1,778	31,774	30,337	1,655	31,992	Mexico, Brazil, Argentina.
Gypsum, thousand tons	1,401	650	2,051	1,404	630	2,034	Mexico, Dominican Republic.
Iodine	------	2,156	2,156	------	2,161	2,161	Chile.
Lithium minerals	------	1,976	1,976	------	• 1,200	• 1,200	Argentina, Surinam.
Magnesite	------	90,548	90,548	------	90,220	90,220	Brazil, Colombia.
Mica	------	1,384	1,384	------	2,059	2,059	Brazil, Argentina.
Nitrogen compounds, thousand tons	80	1,196	1,276	184	1,207	1,391	Chile.
Phosphates (including guano)	262,000	375,000	637,000	300,000	374,000	674,000	Chile, Trinidad, Netherlands Antilles.
Quartz crystal	------	1,246	1,246	------	1,685	1,685	Brazil.
Salt, thousand tons	1,343	2,121	3,464	2,252	1,967	4,219	Mexico, Brazil, Argentina, British West Indies.
Sulfates, hydrous	NA	55,650	NA	NA	58,848	NA	Chile, Argentina.
Sulfur, thousand tons	1,593	111	1,704	1,765	111	1,876	Mexico, Chile, Netherlands Antilles.
Talc and pyrophyllite	4,000	71,500	75,500	4,000	62,300	66,300	Brazil, Argentina, Peru.

See footnotes at end of table.

TABLE 1.—Latin America: Approximate production of principal metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1963			1964			
	Middle America	South America	Total	Middle America	South America	Total	Principal producing countries
Mineral fuels:							
Anthracite	------------	23,000	23,000	------------	33,200	33,200	Peru, Colombia.
Bituminous coal...thousand tons	2,071	[e] 6,952	[e] 9,023	2,138	6,807	8,945	Colombia, Mexico, Brazil, Chile.
Lignite...do	------------	[e] 135	[e] 135	------------	[e] 135	[e] 135	Chile, Ecuador.
Peat	------------	10,825	10,825	------------	3,877	3,877	Argentina.
Coke:							
Oven and beehive...thousand tons	906	1,546	2,452	786	1,607	2,393	Brazil, Mexico, Colombia.
Low temperature	NA	465	NA	NA	444	NA	Brazil, Chile, Argentina.
Natural gas...million cubic feet	523,747	693,929	1,217,676	328,368	786,742	1,115,110	Venezuela, Mexico, Argentina.
Natural gas liquids...thousand 42-gallon barrels	170	12,366	12,536	200	[e] 8,000	[e] 8,200	Venezuela, Colombia, Peru.
Crude petroleum...do	174,675	1,416,791	1,591,466	176,309	1,480,771	1,657,080	Venezuela, Mexico, Argentina.
Petroleum refinery products...do	567,626	669,712	1,237,338	587,009	699,593	1,286,602	Venezuela, Uruguay, Netherlands Antilles.

[e] Estimate. NA Not available.

[1] Statistics include later revisions of some figures appearing in world production tables in volume 1, which will be adjusted in the 1965 edition.

TABLE 2.—Latin American production of selected metals and minerals, expressed as approximate percentages of world and non-Communist world [1] production totals

Commodity	Percentage of world total produced by—			Percentage of non-Communist world [1] total produced by—		
	Middle America	South America	Total Latin America	Middle America [2]	South America	Total Latin America
1963:						
Metals:						
Aluminum ore	26.8	19.3	46.1	34.9	25.7	60.6
Antimony	8.6	14.8	23.4	16.1	27.1	43.2
Arsenic trioxide	NA	NA	NA	27.5	1.9	29.4
Beryllium ore	----------	39.2	39.2	----------	41.1	41.1
Bismuth	14.6	27.7	42.3	16.0	30.8	46.8
Cadmium	25.6	5.0	30.6	30.0	5.7	35.7
Copper:						
Mined	1.5	16.6	18.1	1.9	20.6	22.5
Smelted	1.1	14.4	15.5	1.4	17.8	19.2
Iron ore	.5	7.4	7.9	.7	11.7	12.4
Lead:						
Mined	7.9	8.2	16.1	11.2	11.9	23.1
Smelted	7.3	4.9	12.2	10.3	6.8	17.1
Manganese ore	1.7	9.9	11.6	2.7	22.6	25.3
Mercury	7.6	1.4	9.0	10.7	2.3	13.0
Molybdenum	.1	8.7	8.8	.1	10.5	10.6
Nickel	4.7	.3	5.0	----------	.4	.4
Silver	18.6	18.5	37.1	22.0	22.0	44.0
Tellurium	----------	NA	NA	----------	8.4	8.4
Tin:						
Mined	.6	12.3	12.9	.7	16.8	17.5
Smelted	.6	2.3	2.9	.7	3.2	3.9
Tungsten ore, 60 percent WO_3 equivalent	.1	5.8	5.9	.2	16.2	16.4
Zinc:						
Mined	6.9	6.3	13.2	9.2	8.4	17.6
Smelted	1.6	2.2	3.8	2.2	2.9	5.1
Nonmetals:						
Barite	8.8	6.7	15.5	10.9	8.2	19.1
Cement	1.2	3.7	4.9	1.3	4.9	6.2
Fluorspar	22.7	.4	23.1	27.5	.6	28.1
Graphite, natural	4.2	.3	4.5	5.0	.3	5.3
Gypsum	3.1	1.4	4.5	3.5	1.7	5.2
Salt	1.8	2.5	4.3	1.9	3.1	5.0
Sulfur	12.4	.9	13.3	14.7	1.0	15.7
Mineral fuels:						
Petroleum, crude	1.7	14.7	16.4	2.3	18.0	20.3
1964:						
Metals:						
Aluminum ore	27.0	19.9	46.9	34.8	25.5	60.3
Antimony	7.7	16.6	24.3	13.2	28.4	41.6
Arsenic trioxide	NA	NA	NA	28.8	1.6	30.4
Beryllium ore	----------	31.5	31.5	----------	39.0	39.0
Bismuth	14.3	30.4	44.7	16.2	34.3	50.5
Cadmium	24.0	5.8	29.8	28.1	6.8	34.9
Copper:						
Mined	1.5	16.5	18.0	1.7	20.3	22.0
Smelted	1.0	14.2	15.2	1.2	17.4	18.6
Iron ore	.4	8.6	9.0	.6	13.3	13.9
Lead:						
Mined	7.3	8.5	15.8	10.6	12.4	23.0
Smelted	6.1	4.9	11.0	8.6	7.1	15.7
Manganese ore	1.7	9.8	11.5	2.6	21.0	23.6
Mercury	5.0	1.4	6.4	7.3	2.1	9.4
Molybdenum	.1	10.6	10.7	.1	12.9	13.0
Nickel	4.4	.3	4.7	----------	.4	.4
Silver	18.3	18.8	37.1	21.7	22.4	44.1
Tellurium	----------	NA	NA	----------	16.7	16.7
Tin:						
Mined	.7	13.5	14.2	.9	17.7	18.6
Smelted	.6	2.8	3.4	.8	3.7	4.5
Tungsten ore, 60 percent WO_3 equivalent	(3)	5.3	5.3	(3)	13.3	13.3
Zinc:						
Mined	6.1	6.7	12.8	8.0	8.6	16.6
Smelted	1.6	2.3	3.9	2.2	3.0	5.2

See footnotes at end of table.

TABLE 2.—Latin American production of selected metals, etc.—Continued

Commodity	Percentage of world total produced by—			Percentage of non-Communist world[1] total produced by—		
	Middle America	South America	Total Latin America	Middle America[2]	South America	Total Latin America
1964—Continued						
Nonmetals:						
Barite	10.6	6.2	16.8	13.1	7.6	20.7
Cement	1.2	3.8	5.0	1.6	5.0	6.6
Fluorspar	19.9	.4	20.3	23.7	.5	24.2
Graphite, natural	5.6	.3	5.9	7.1	.3	7.4
Gypsum	3.0	1.4	4.4	3.4	1.6	5.0
Salt	2.3	2.0	4.3	3.2	2.7	5.9
Sulfur, elemental	12.6	.8	13.4	14.8	.9	15.7
Mineral fuels:						
Petroleum, crude	1.7	14.3	16.0	2.1	17.4	19.5

NA Not available.

[1] Excludes Albania, Bulgaria, mainland China, Cuba, Czechoslovakia, East Germany, Hungary, North Korea, North Viet-Nam, Poland, Rumania, U.S.S.R., and Yugoslavia.

[2] Excluding Cuba.

[3] Less than ½ unit.

Latin American mineral output relative to total world and non-Communist world output, however, is of less economic significance domestically than the relationship between the mineral economies of Latin America and the United States. The importance of Latin American production and exports to the import needs of the United States is outstanding. Of the 33 mineral items listed in table 3, 16 comprised more than half the U.S. imports from all sources in 1964, 9 ranged between 25 and 50 percent, and 8 between 7 and 25 percent, with only 1 (columbium ore) below the 10 percent level.

In actual quantities U.S. imports from Latin America in 1964 as compared with 1963 increased in 19 of the listed items: antimony, bauxite, bismuth, cadmium, copper, gold, iron ore, tin, tungsten, barite, fluorspar, gypsum, nitrogen compounds, phosphates, salt, sulfur, natural gas, natural gas liquids, and petroleum refinery products. Quantitative decreases were registered in the remaining 14 items: beryl, columbium ore, lead, manganese ore, mercury, silver, tantalum ore, zinc, graphite, iodine, mica, quartz crystal, strontium minerals, and crude petroleum.

The cumulative value of direct U.S. investments abroad increased $3,658 million (9 percent) to $44,343 million from the end of 1963 to the end of 1964. The largest increases were in manufacturing, up $1,924 million (12.9 percent) to $16,861 million, and in the mineral industries, up $894 million (5.25 percent) to $17,916 million. The largest segment of the mineral industries was petroleum, up $699 million to $14,351 million, while mining and smelting advanced $195 to $3,565 million. Geographic distribution of the investment in the mineral industries, as presented in table 4, shows Latin America ahead of all other areas at the end of each year in total mineral industries and in petroleum, and second to Canada in mining and smelting.

TABLE 3.—U.S. imports for consumption of selected metals and minerals, and percentages received from Latin America

Commodity	1963				1964			
	Total quantity	Percent from—			Total quantity	Percent from—		
		Middle America	South America	Total Latin America		Middle America	South America	Total Latin America
Metals:								
Antimony:								
In ore......short tons	9,784	41.2	18.2	59.4	10,676	37.0	24.9	61.9
Needle or liquated......do	22	---	---	---	31	---	---	---
Refined metal......do	5,717	5.9	3.7	9.6	3,307	10.0	14.2	24.2
Oxide......do	2,089	---	(1)	(1)	3,131	---	---	---
Bauxite......thousand long tons	9,212	68.3	31.4	99.7	[r] 10,180	67.1	32.6	99.7
Beryl......short tons	6,243	---	48.6	48.6	5,425	---	42.9	42.9
Bismuth (general imports)......pounds	1,123,466	14.8	64.9	79.7	1,238,252	19.8	70.8	90.6
Cadmium in metal and flue dust [2]......thousand pounds	2,095	53.5	7.3	60.8	2,376	57.4	.7	58.1
Columbium ore......pounds	5,909,512	---	30.2	30.2	4,600,800	---	7.7	7.7
Copper [3]......short tons	156,299	1.0	23.0	24.0	280,517	.9	40.1	41.0
Gold in ore, base bullion, and refined bullion......troy ounces	1,280,619	9.5	18.4	27.9	1,168,885	8.8	43.3	52.1
Iron ore......thousand long tons	33,263	(1)	39.0	39.0	42,408	(1)	33.7	33.7
Lead in unmanufactured forms......short tons	381,877	23.6	17.4	41.0	351,299	23.3	18.5	41.8
Manganese in ore (of 35 percent Mn or more)......do	1,124,109	5.9	43.9	49.8	1,430,431	4.7	28.5	33.2
Mercury......76-pound flasks	42,872	10.0	9.3	19.3	41,153	3.3	6.7	10.0
Silver in ore, base bullion, and refined bullion..thousand troy ounces	59,062	28.3	34.8	63.1	51,674	23.0	31.1	54.1
Tantalum ore......pounds	944,459	---	26.5	26.5	980,702	---	15.0	15.0
Tin in ore, block, pigs, and grains......long tons	44,933	---	7.8	7.8	36,772	.1	17.0	17.1
Tungsten in ores and concentrates......thousand pounds	3,060	---	49.9	49.9	3,148	---	59.6	59.6
Zinc in ores and refined......short tons	511,267	31.9	15.4	47.3	454,371	27.3	17.4	44.7
Nonmetals:								
Barite......short tons	578,394	27.7	18.1	45.8	601,010	31.3	19.6	50.9
Fluorspar......do	559,653	80.1	(1)	80.1	687,933	80.4	(1)	80.4
Graphite, natural amorphous......do	46,128	86.1	---	86.1	42,326	79.6	---	79.6
Gypsum, crude......thousand short tons	5,490	19.8	---	19.8	6,258	21.4	.2	21.6
Iodine......thousand pounds	3,336	---	73.8	73.8	2,592	---	78.6	78.6
Mica, all forms......do	26,559	(1)	10.3	10.3	16,600	.1	10.8	10.9
Nitrogen compounds (major)......short tons	1,532,314	2.1	30.2	32.3	1,536,631	20.4	25.3	45.7
Phosphate, crude, and phosphatic fertilizers......long tons	224,852	49.4	3.0	52.4	226,331	49.6	3.2	52.8
Quartz crystal, electronic and optical grades......pounds	282,700	---	97.0	97.0	214,332	---	97.5	97.5
Salt......thousand short tons	[r] 1,516	38.3	---	38.3	2,340	36.2	---	36.2
Strontium minerals......short tons	16,232	39.9	---	39.9	21,617	24.4	---	24.4
Sulfur......thousand long tons	1,351	63.9	---	63.9	1,462	61.0	(1)	61.0
Mineral fuels:								
Natural gas......million cubic feet	406,000	12.3	---	12.3	427,641	12.1	---	12.1
Natural gas liquids......thousand gallons	193,073	93.6	.1	93.7	225,346	94.7	.7	95.4
Petroleum, crude......thousand 42-gallon barrels	412,660	.9	44.8	45.7	438,643	.8	42.0	42.8
Petroleum refinery products......do	362,053	47.6	43.4	91.0	388,200	50.8	44.0	94.8

[r] Revised.

[1] Less than ½ unit.

[2] Exclusive of unreported quantities of cadmium contained in imported zinc concentrates.

[3] Copper content of ores and concentrates, regulus, black, coarse, unrefined, blister, refined in ingots etc., old and scrap, old brass and clippings.

Mexico, Venezuela, and Brazil have been the area's leading markets for direct U.S. investments as well as for exports. Other markets of notable or emerging importance for both investment and trade include Argentina, Chile, Colombia, Peru, Jamaica, Trinidad and Tobago, and the Central American Common Market countries of Guatemala, Honduras, El Salvador, Nicaragua, and Costa Rica.

TABLE 4.—Latin America: Value of direct U.S. investments in basic mineral industries abroad, by areas, at yearend 1963 and 1964

(Millions dollars and, in parentheses, percentages of totals for all foreign areas)

Area	1963			1964 [p]		
	Mining and smelting	Petroleum	Total mineral industries	Mining and smelting	Petroleum	Total mineral industries
All foreign areas, total	3,370	13,652	17,022	3,565	14,351	17,916
Latin America:						
Middle America	371	825	1,196	428	875	1,303
South America	932	2,811	3,743	920	2,836	3,756
Total	1,303	3,636	4,939	1,348	3,711	5,059
Percentage	(38.7)	(26.6)	(29.0)	(37.8)	(25.9)	(28.3)
Canada	1,549	3,134	4,683	1,671	3,228	4,899
Percentage	(46.0)	(23.0)	(27.5)	(46.9)	(22.5)	(27.4)
Western Europe:						
Common Market countries	10	1,330	1,340	13	1,511	1,524
Other	45	1,446	1,491	43	1,575	1,618
Total	55	2,776	2,831	56	3,086	3,142
Percentage	(1.6)	(20.3)	(16.6)	(1.6)	(21.5)	(17.5)
Asia:						
Middle East	2	1,206	1,208	2	1,239	1,241
Far East	30	714	744	32	775	807
Total	32	1,920	1,952	34	2,014	2,048
Percentage	(0.9)	(14.1)	(11.5)	(0.9)	(14.0)	(11.4)
Africa	349	702	1,051	356	830	1,186
Percentage	(10.4)	(5.1)	(6.2)	(10.0)	(5.8)	(6.6)
Oceania	82	496	578	100	444	544
Percentage	(2.4)	(3.6)	(3.4)	(2.8)	(3.1)	(3.0)
International	------	988	988	------	1,038	1,038
Percentage	------	(7.3)	(5.8)	------	(7.2)	(5.8)

[p] Preliminary.

However, the 1963–64 increase in value of direct investments in the combined mineral industries of Latin America was only $120 million (2.4 percent), compared with $311 million (11 percent) in Western Europe, $216 million (4.6 percent) in Canada, $135 million (12.8 percent) in Africa, and −$34 million (−5.9 percent) in Oceania. The high overall investment in Latin America reflects U.S. need for basic mineral raw materials abundant in that area, and accounts to a large extent for the development of extractive industries that have made possible the high level of production.

The low 2.4 percent increase was offset to some extent by a $283 million (12.7 percent) increase in investment in manufacturing in support of the upward trend of industrialization whereby Latin America is fabricating more and more of its natural resources into finished goods. To some extent, not quantitatively measurable, the declining rate of new investment reflects factors of extreme nationalism, political uncertainty, and disappearing stability of contractual agreements that have impinged far more heavily on the investment risks attendant to the extractive (and public utility) industries than those of manufacturing. These factors have characterized nations advancing toward industrial maturity throughout the world and may be regarded as symptomatic of such growth in Latin America.

The framework for industrial and overall economic development includes positive factors of rapidly expanding population and enormous untapped resources. Negative factors, in addition to those mentioned above (except in the case of Mexico), include bottlenecks in foreign exchange, imbalances of class stratification, widespread inflation, and difficulties in moving away from outmoded legislative barriers, administrative and managerial traditions, and economic policies. Efforts have been and continued to be made to overcome those negative factors that are nonpolitical, but progress has been slow.

The importance of the mineral industries to the countries in which they operate is minimized in conventional statistics which include such mineral processing industries as the milling of steel and nonferrous metals, the manufacture of cement, lime, plaster, refractory and ceramic products, and the refining of coal tar products and petrochemicals in the industrial sector of the economy.

In 1964 known mineral production for the total Latin American area increased over that of 1963 in 39 items, including such high value commodities as bauxite, antimony, cadmium, copper, gold, iron ore, iron and steel, manganese ore, tin, zinc, barite, cement, fluorspar, nitrates, phosphates, salt, sulphur, crude petroleum, and petroleum refinery products. Decreases were recorded in 17 items, including important beryl, lead, mercury, platinum, silver, tungsten, borates, coal and coke, natural gas, and natural gas liquids. All of the cited items, except iron and steel, cement, coal and coke, natural gas, and with some exceptions salt, natural gas liquids, and petroleum refinery products, have been produced primarily for export. The overall trend was upward in both quantity and value, but lack of sufficient regional data prevents determination of a realistic ratio of total value to total gross national product (GNP).

In the United States, the value of total mineral production—metals, nonmetals, and mineral fuels—represents approximately 3.3 percent of the GNP. If this is regarded as normal to a balanced economy, it may be concluded that Bolivia, British Guiana, Chile, Peru, Surinam, Venezuela, Haiti, Trinidad and Tobago, the Netherlands Antilles, Jamaica, and possibly Mexico are overdependent on the mineral industries and in need of greater emphasis on the development of other segments of their economies, which in the case of Mexico is being effectively applied. Argentina and Brazil have extremely diverse mineral activities including several that are basically essential to their industrial growth but which in total contribute less than 2 percent to their GNP. Their known mineral resources are adequate to support substantial acceleration of development. The mineral industry of Columbia has supplied approximately 3.5 percent of the GNP in a well balanced but underdeveloped economy. However, the ratio of mineral productivity to the GNP is rarely a factor in determining either the development of the mineral industries or their basic importance. The Dominican Republic and Guatemala have important nickel resources which could bring them into ultimate international prominence.

Elsewhere in Latin America, the potential for developing mineral industries other than processing imported raw materials is very modest in Uruguay and Paraguay, negligible in the French and British Antilles, and inadequately explored in Central America, French Guiana, and Ecuador.

Latin America has economic problems as heterogenous in detail as its political composition, but one has traditionally characterized the region as a whole; namely, a dependence on industrialized areas of the world for its raw material markets and its requirements for manufactured goods. In the present century, and particularly since World War I, the aspirations of all the Latin American countries have been to reduce this dual dependence and improve the economic and social welfare of the people by initiating and expanding diverse industrial structures commensurate with their available resources.

Since World War II, internal efforts to realize these aspirations have received tremendous assistance from the United States and various international financial and technological organizations. In many areas the combined efforts have been successful in degrees ranging from moderate to remarkably high. The closest approach to attainment of the prescribed goal has been in Mexico, which is rapidly achieving a well integrated economy of agriculture, mining, manufacturing, commerce, and tourism, with attendant growth of living standards and an effective middle class. By 1964 manufacturing was contributing more than 20 percent of the GNP in Mexico, Argentina, Brazil, Peru, and Uruguay, and 15 or more percent in Chile, Colombia, Ecuador, El Salvador, Paraguay, Surinam, and Trinidad and Tobago. Developments at lower levels but encouraging rates were progressing in most of the other countries. Increase in industrial output of the area as a whole in 1964 was 8.2 percent over that of 1963, reversing the recent downward trend in industrial growth from 7.5 percent in 1961 to 3 percent in 1962 to 1.3 percent in 1963.

The economic growth of Uruguay has been rapid but incapable of supporting the overextended social welfare benefits adopted by the Government, and by 1964 the country was verging on bankruptcy.

Elsewhere efforts to assist internal economic improvement have been delayed by political difficulties in Bolivia and the Dominican Republic, and indifference in Haiti. The destiny of Cuba has been guided by the Communist regime since 1959, without free world assistance.

The economy of the combined Latin American Republics (excluding Cuba) showed an upward trend in 1964 according to the Economic Survey of Latin America for 1964 issued by the Economic Commission for Latin America, a component of the United Nations Economic and Social Council which does not include the European dependencies of the Caribbean area or Jamaica or Trinidad in its Latin America grouping. With those indicated exceptions, the aggregate domestic product of the region expanded by more than 5 percent (corresponding to 2 percent per capita) while real income rose about 6 percent (corresponding to 3 percent per capita) over the 1963 level. This improvement contrasted sharply with the weakness of domestic product growth in 1963 (2 percent) and 1962 (3.5 percent). However, the region's growth rate during the first 4 years of the nineteen sixties was slower than in the fifties.

Contributing to the 1964 improvement were the increase in number and variety of exports and the rise in export earnings resulting from the higher prices they commanded. Price rises for some commodities (e.g., sugar, wool, cacao, and cotton) stopped in mid 1964, but for minerals remained steady. Increases were registered in the consumption of such economic indicators as domestically produced steel (approximately 13 percent), cement (12 percent), and petroleum products (7.6 percent). Growth of the steel industry has been phenomenal. In only 5 years, Latin America has doubled its volume of steel production, with outstanding progress in Brazil, Mexico, Argentina, Venezuela, and Chile.

In an effort to coordinate international trade patterns, a Latin American Free Trade Association (LAFTA) was established by the Treaty of Montevideo in February 1960, with Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, and Uruguay joined in membership. Mutual agreement on tariff concessions was limited to items of little trade significance, and the organization has not yet become an instrument of outstanding benefit.

In December 1960 a Central American Common Market (CACM) was formed by a General Treaty on Central American Economic Integration, signed by the Governments of El Salvador, Guatemala, Honduras, and Nicaragua. Costa Rica joined later. British Honduras and Panama had not joined at yearend, but Panama has been considering the benefits of membership. By means of the treaty, the signatory countries consolidated various bilateral and multilateral agreements negotiated during the nineteen fifties and undertook to establish a free trade area for specified products and merchandise originating in the member countries, and at the same time to adopt a common tariff for nonmember countries as provided for in the Central American Agreement on the Equalization of Import Duties and Charges, signed in September 1959.

Other provisions of the CACM Treaty included adoption of a Central American Standard Customs Code, equalization of laws regulating tax incentives to industrial development, and consolidated treatment to enterprises of individual member countries engaged in the construction of works of economic benefit to all.

Vigorous application of the terms and spirit of the Treaty has made the area one of the fastest growing economically in Latin America or the underdeveloped world in general. In 1964 the regional trade had increased over that of 1960 by 88 percent in agricultural and forest products and a phenomenal 414 percent in industrial goods, replacing to a large extent regional imports of nondurable consumer goods and building materials. Cement production increased 44.5 percent. New industries that have started operations include, among others, petroleum refineries and plants for the production of fertilizers, sulfuric and nitric acid, copper wire and cable, steel rods, and welded steel tubing. In 1964 plans were announced for new plants to manufacture caustic soda, chlorine, and other chemicals, and preliminary studies were under way for the establishment of an iron and steel industry. Although Honduras has been the fourth largest producer of silver in Latin America in recent years, the mining industry has been of limited importance to the principally agricultural countries of Central America, yielding relatively minor quantities of gold, lead, zinc, cadmium, and copper. Limestone, gypsum, diatomaceous earth, and other minerals for construction are produced on a scale generally sufficient to meet local demands but not for trade outside the CACM countries. However, bauxite and nickel deposits are known that warrant active exploitation and may be expected to contribute to the economy of the area in the near future. Other mineral resources, including iron ore, await examination and evaluation.

Despite the challenge of numerous obstacles, Central America has joined Latin America as a whole in entering 1965 as the world's ripest industrial frontier.

The Mineral Industry of Mexico

By Hazel B. Comstock[1] and Sumner M. Anderson[2]

MEXICO continued in 1964 as one of the leading mineral producing countries of the world. The total value of its mineral production, including mineral fuels, was $704 million and represented an increase of 8.4 percent over that of 1963. As a result of high world prices for many of its products, Mexico's metal-mining industry registered a 7.7-percent increase in value of production above that of 1963, although tonnage output was virtually static, with gains in arsenic trioxide, bismuth, iron and steel, maganese ore, molybdenum, selenium, and tin offset by decreases in antimony, cadmium, copper, iron ore, lead, mercury, silver, strontium, tungsten, and zinc. Quantitative gains were registered in all the important nonmetals and mineral fuels, and in coal byproducts and petrochemicals. As in several years past, Mexico was the world's leading producer of silver and fluorspar, was second in bismuth, strontium minerals, and sulfur, and second or third in arsenic trioxide. Although some small mining operations were closed owing to ore depletion, several came into production during the year and marginal operators continued, as a result of high prices.

Increased domestic smelting of iron and steel and the refining of petroleum reflected the progress in erecting new plants and expansion of capacities of a number of existing facilities. The rising rate in building construction was reflected in the increase of 18.6 percent in cement production. As in 1963, the mining industry employed an estimated 55,000 persons.

The entire mineral industry accounted for 26.5 percent of the foreign exchange earnings of 1964, compared with 28 percent in 1963. Exports of metals, nonmetals, and mineral fuels were estimated at US$280 million in 1964 compared with US$268 million in 1963. Although the United States continued to lead as a market for Mexican metals, nonmetals, and mineral fuels, U.S. imports of those products fell 7 percent in value below those of 1963, to approximately US$250 million.

Mexican imports of metals, nonmetals, and mineral fuels rose slightly but were very small in comparison with exports.

Because of an estimated 10-percent increase in the consumption of petroleum products, particularly LP gas, gasoline, and diesel fuel oil, about 10 million barrels of the refined products was imported. Exploration by Petróleos Mexicanos (PEMEX), the Government petroleum monopoly, discovered seven gasfields and three small oilfields during 1964.

---

[1] Mineral specialist, Mineral Resource Development.
[2] Chief Latin America specialist, Division of International Activities.

Of the reported 1964 Mexican gross national product equivalent to US$18 billion (at current prices), the output of mineral products in the country accounted for 3.9 percent, or $704 million.

GOVERNMENT POLICIES AND PROGRAMS

The Government of Mexico continued to emphasize its role in the country's economic development. Legislation approved in December included a revision of the income tax system that eliminated the tax on reinvestment of company profits.[3] However, members of the mining industry were critical of the reluctance of Mexican investment capital to implement the 1961 mining law. They stated that the tax burden imposed on operators who had been unable to comply with that law had seriously restricted mineral exploration or development in 1964.

Despite these obstacles, Mexicanization of the mining industry continued. Two silver mining operations, Sombrete and Tocayos in Zacatecas, were Mexicanized. Cía. Minera Asarco, S.A., a subsidiary of the American Smelting and Refining Co. (Asarco), and the largest remaining wholly foreign-owned mining firm in the country, continued negotiations toward Mexicanization, but these were incomplete at yearend. The reasons for failure in this instance included disagreement upon value of the company's properties, the lack of Mexican investors' interest because investments were available that yielded higher returns, and difference of opinion within certain branches of the Government because some tax revenues might be lost through the company's Mexicanization. An attempt to comply with the law had been made previously by placing 51 percent of Asarco stock in escrow with the Bank of Mexico. The new Government administration, installed December 1, 1964, appointed several mining men from private industry to positions of official authority, and it was hoped that fiscal measures would be taken in 1965 to create incentives for expanded exploration, development, and investment within the industry. One of the new administration's first measures was to place the revenues and expenditures of the petroleum monopoly, Petróleos Mexicanos (PEMEX), under the control of the Treasury. This control extended to all borrowing of foreign funds by PEMEX.

In November the Mexican Government revised its tariff system by adopting the Brussels nomenclature. Items not covered by specific tariff fractions were placed in basket categories generally subject to the highest rates of duty for the general group of goods. The creation of such basket categories affected many industries, because the duties on a wide variety of raw materials were increased substantially. Export taxes on certain metals were based upon the price of the metals. The price was fixed by the Government as an average between the New York price and the London Metal Exchange. Under 1964 marketing conditions, those firms that exported to the United States were penalized by a higher export price and tax, and the firms that shipped their products to other countries were given a lower export price and tax.

---

[3] Commercio Exterior de Mexico. The Fiscal Reform. V. 11, No. 1, January 1965, pp. 6–8.

PRODUCTION

The total value of minerals produced in Mexico in 1964 was increased 8.4 percent over that of 1963 to US$704 million mainly as a result of the high prices paid for the major metals and minerals exported.

The value of output of Mexico's metal products rose 7.7 percent to US$280 million, and the value of output of nonmetals rose 23 percent to US$174 million. Production of mineral fuels showed a net gain of 0.6 percent in quantity, for a total value of US$250 million.

The most important value increases in the production of metals were in zinc, silver, and lead, all of which declined in tonnage output. Nevertheless, compared with 1963, the value of zinc production rose 14.4 percent to US$75.3 million, that of silver increased 2.6 percent to US$54 million, and that of lead 7.8 percent to US$50 million.

The most significant increase in output of nonmetals was that of cement, up 17.9 percent in quantity, with a total value of US$79.5 million. Production of sulfur rose 11 percent to 1.7 million tons in 1964, valued at about US$40 million. An increase of 29.6 percent was recorded in the quantity of fluorspar produced, with a 36.2-percent increase in value to US$11 million. Petroleum production was held to an increase of only 0.6 percent by the declining yield of several fields.

TABLE 1.—Mexico: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Ingots	-----------	-----------	-----------	4,772	17,678
Alloys	-----------	-----------	-----------	526	1,232
Semifinished and finished products	-----------	-----------	-----------	13,297	14,177
Antimony:					
In untreated ore and concentrate	2,900	3,018	3,924	3,899	3,805
In smelter products	1,331	590	842	927	983
Total	4,231	3,608	4,766	4,826	4,788
Arsenic trioxide (As_2O_3)	16,752	16,709	14,834	12,906	15,196
Arsenic content (as reported)	[r] 12,331	12,281	[r] 10,900	9,779	11,169
Bismuth .... kilograms	271,900	[e] 292,000	354,000	427,000	472,000
Cadmium:					
In untreated zinc concentrate [e]	2,329	2,461	2,514	2,312	2,123
In flue dust [r]	[1] 840	[1] 822	[1] 577	[1] 540	[2] 659
Refined metal	[2] 81	[2] 47	[1] 29	[r] [2] 148	[2] 118
Total recoverable [e]	3,250	3,330	3,120	3,000	2,900
Chromite	3	5	-----------	-----------	-----------
Copper:					
In ores mined	60,330	49,314	47,125	55,861	52,506
Smelted and refined	58,841	47,625	45,520	54,436	51,015
Gold .... troy ounces	300,256	268,684	236,758	237,948	209,976
Iron ore, 60 percent Fe equivalent	868,760	1,145,000	1,818,850	2,328,137	2,195,000
Iron content (as reported)	521,256	687,000	1,091,310	1,396,882	1,392,467
Iron and steel:					
Pig iron	669,265	757,759	801,324	833,118	959,000
Sponge iron	114,832	173,891	165,647	169,735	202,208
Ferroalloys	16,275	26,156	25,739	25,917	42,568
Steel ingots	1,491,778	1,693,076	1,710,662	2,016,883	2,326,000
Steel castings	10,970	13,706	9,382	11,382	
Semifinished and finished steel	1,307,234	1,329,430	1,278,905	1,379,794	1,555,002
Lead:					
In ore and concentrate	190,670	181,326	193,298	189,987	169,957
In smelter and refinery products	186,212	176,426	189,100	186,170	166,703

See footnotes at end of table.

Digitized by Google UNIVERSITY OF ILLINOIS LIBRARY

TABLE 1.—Mexico: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals—Continued					
Manganese ore 44.8 to 46.1 percent Mn	155,500	141,400	167,700	171,700	187,300
Mercury ____ 76-pound flasks	20,114	18,101	18,855	17,202	12,560
Molybdenum ores:					
Molybdenum sulfide (MoS_2) content ____ kilograms	100,452	5,035	97,218	68,755	70,984
Molybdenum (Mo) content ____ do	60,271	3,021	58,331	41,253	42,582
Nickel, in ore	30	132	---	---	---
Selenium ____ kilograms	3,150	2,559	3,154	2,874	4,239
Silver ____ thousand troy ounces	44,526	40,349	41,249	42,760	41,732
Strontium ore (U.S. imports from Mexico)	2,613	2,397	4,131	5,875	4,788
Tin:					
In ores mined ____ long tons	372	530	576	1,056	1,275
Refined ____ do	365	559	520	1,056	1,145
Titanium, ilmenite	---	---	---	141	---
Tungsten ore, 60 percent WO_3 basis	184	175	80	33	11
Zinc:					
In ore and concentrate	262,425	268,973	250,683	239,818	[r] 235,604
In smelter and refinery products	52,905	51,818	56,908	56,751	59,426
Nonmetals:					
Agate ____ kilograms	5,300	400	NA	NA	NA
Barite	270,757	248,708	318,136	256,957	326,017
Calcite, optical ____ kilograms	107	[2] 219	[2] 216	[2] 3,407	NA
Cement:					
Gray	3,024,253	2,969,701	3,284,569	3,596,261	4,284,837
White	64,875	65,383	67,540	77,463	92,530
Other	---	---	---	88,318	86,319
Total	3,089,128	3,035,084	3,352,109	[1] 3,762,042	4,463,686
Clays:					
Kaolin	73,976	60,700	NA	46,561	64,225
Refractory	20,453	37,753	NA	NA	NA
Common	5,647	5,797	NA	NA	NA
Bentonite	NA	NA	NA	4,245	NA
Dolomite	46,743	68,300	NA	NA	NA
Feldspar	9,127	14,833	NA	NA	NA
Fluorspar:					
Production	366,945	398,514	502,256	481,619	624,069
U.S. imports from Mexico:					
Acid grade	114,472	111,311	177,266	[r] 178,165	246,996
Metallurgical grade	287,872	291,034	261,732	301,727	253,497
Total	402,344	402,345	438,998	[r] 479,892	500,493
Graphite, amorphous	34,315	18,004	29,023	29,996	30,337
Gypsum	789,789	777,898	794,554	1,097,339	1,165,054
Limestone:					
For cement (estimate) thousand tons	4,020	3,950	4,360	4,780	5,640
Other ____ do	1,163	1,067	NA	NA	240
Total (estimate)	5,183	5,017	NA	NA	5,880
Marble	NA	NA	NA	NA	56,782
Perlite	6,030	7,238	NA	NA	NA
Phosphates:					
Rock phosphate	27,500	[r] 64,146	64,909	[e] 30,000	27,895
Calcium superphosphate, ordinary	(2)	106,637	109,400	161,405	118,385
Triple superphosphate					42,626
Guano, beneficated	(2)	69	456	NA	(2)
Refractory material, unidentified	985	591	(2)	(2)	(2)
Salt ____ thousand tons	994	1,063	1,292	1,225	1,783
Sand, silica	123,808	136,800	[e] 145,000	154,978	(2)
Sodium-magnesium sulfate (blödite)	21,312	7,626	(2)	(2)	(2)
Sulfur:					
Frasch processed	1,261,574	1,166,920	1,372,039	1,480,026	1,662,016
Mined	[e] 17,700	25,116	26,751	28,968	25,989
Recovered from natural gas	46,839	52,849	47,939	44,003	36,878
Total	[e] 1,326,100	1,244,885	1,446,729	1,552,997	1,724,883
Talc	4,372	4,188	[e] 4,000	[e] 4,000	NA

TABLE 1.—Mexico: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Mineral fuels:					
Bituminous coal ______ thousand tons__	1,776	1,818	1,893	2,071	2,138
Coal products:					
Coke ______ thousand tons__	835	781	780	906	786
Coke breeze (finos de coque) ______	______	______	______	21,265	21,138
Coal tar ______	______	______	______	11,628	12,238
Creosote ______	(2)	11,145	9,981	10,747	11,877
Ammonium sulfate ______	(2)	9,733	9,325	8,855	10,633
Benzol ______	(2)	3,907	4,104	5,190	5,710
Naphthaline ______	______	______	______	273	568
Synthetic carbon brushes and rings.	______	______	______	12	16
Coal gas ______ million cubic feet__	______	______	______	2,971	3,489
Natural gas ______ do____	360,691	381,027	392,444	424,371	512,597
Sales ______ do____	130,751	165,056	190,928	217,636	247,953
Petrochemicals:					
Light alkaloids ______	2,265	3,651	6,045	5,056	6,591
Heavy alkaloids ______	1,043	4,332	6,845	3,844	4,645
Dodecylbenzene ______	10,314	19,600	27,213	20,584	26,082
Ammonia ______	______	______	57,315	103,393	124,292
Ammonium sulfate ______	______	______	260	217	363
Carbon dioxide ______	______	______	65,562	125,789	148,818
Petroleum:					
Crude (includes distillates and natural gas liquids) thousand 42-gallon barrels__	108,768	116,816	121,559	125,825	129,499
Refinery products:					
Gasoline:					
Aviation ______ do____	413	688	640	648	695
Other (including naphthas) thousand 42-gallon barrels__	27,175	31,781	32,487	33,860	36,000
Total ______ do____	27,588	32,469	33,127	34,508	36,695
Jet fuel ______ do____	176	494	609	786	955
Kerosine ______ do____	10,807	11,601	11,680	11,706	12,187
Distillate fuel oil ______ do____	13,003	13,716	15,658	[r] 16,995	20,681
Residual fuel oil ______ do____	42,068	47,432	45,185	[r] 42,511	39,952
Lubricants, including greases thousand 42-gallon barrels__	1,080	1,148	1,141	1,220	1,270
Asphalts ______ do____	1,898	1,778	2,061	2,004	2,321
Liquid petroleum gas ___ do____	3,888	5,064	4,652	5,793	6,734
Other ______ do____	1,714	1,952	1,891	2,261	2,252
Total refinery products thousand 42-gallon barrels__	102,222	115,654	116,004	[r] 117,784	123,047

[e] Estimate. [r] Revised. NA Not available.

[1] U.S. imports.

[2] Exports.

TRADE

Exports of metals, nonmetals, and mineral fuels increased 4 percent in value from US$268 million in 1963 to approximately US$280 million in 1964. This relatively small overall increase in comparison with the increase of 8.4 percent in the value of production and despite higher unit prices for many export commodities, reflected progressively rising domestic demands for mineral products.

Gold dropped to 11th place as an earner of foreign exchange. Rising domestic consumption of the metal in coinage and the creative arts accounted for the decrease of 26.1 percent in quantity and 23.7 percent in value. Silver exports declined 29.8 percent in quantity and 28.4 percent in value. As with gold, domestic demands were higher than in 1963, and the high level of exports in 1963 had drained the stocks of silver. With Mexico the leading world producer, this decline in exports intensified the international silver shortage. The decline of 33.8 percent in quantity and 35.4 percent in value of copper reflected increased consumption, for production fell less than 5 percent in quantity and increased in value. Although the volume of lead production fell nearly 8 percent below that of 1963, exports decreased 31.2 percent in quantity and 23.7 percent in value. Zinc was again the major metallic export, but increased domestic consumption caused a 3.4-percent decline in volume of exports. Rising prices, however, enabled Mexico to realize an increase of 8.4 percent in value of zinc exports above that of 1963. Exports of antimony fell 1.8 percent in quantity below the 1963 level, but the advance in price enabled Mexico to realize an increase of 59.5 percent in value. Exports of mercury decreased 31.8 percent in quantity but increased 11.1 percent in value. Exports of arsenic, bismuth, cadmium, tin, and molybdenum increased in quantity 37, 21, 7, 195, and 40 percent, respectively, and in value, 44, 23, 44, 911, and 41 percent, respectively. Exports of tungsten fell 75 percent in quantity and 55 percent in value. These sharp percentage decreases corresponded, however, to a decrease of only 15 tons in quantity and 126,000 pesos in value. While the sharp percentage increase in tin indicated growth in foreign marketing, the actual tonnage of exports as related to production was relatively small. The increase in production was 92 tons. The quantity of molybdenum exports increased from 67 tons in 1963 to 89 tons, with an increase in value of 658,000 pesos.

Increased exports of iron ore, all to the United States, were not in economically significant quantities.

During the year a proposal to the Mexican Government came from Japan for the Japanese to work the Colima iron deposits near Monzonillo and export 2 million tons of the ore per year for 50 years. The Mexican Government rejected the proposal as being contrary to the official policy of iron ore conservation for domestic industrial development. A total of 111,000 tons of iron and steel products exported in 1964 was valued at US$19 million.

Exports of graphite remained equal in quantity and value to those of 1963. The exports of sulfur rose 26.3 percent in quantity to 1.84 million tons, and prices increased 9.6 percent in 1964.

Exports of fluorspar rose 23.2 percent in quantity and 21.5 percent in value above 1963 levels. Controversy over sampling and analytical methods arose when shipments of some Mexican fluorspar, labeled acid grade (97 percent CaF_2 or above) with duty of $2.10 per ton, were determined by U.S. Customs assay laboratories to be metallurgical grade (below 97 percent CaF_2), which is dutiable at $8.40 per ton. Before the end of the year, U.S. Customs was working with the Mexican producers to resolve the dispute.

The National Association of Importers and Exporters of Mexico cooperated with the Government in planning to open early in 1965 a National Foreign Trade Institute for training Government and business personnel in the technical and cultural aspects of world trade.

Imports of minerals, principally nonmetallic with the main exception of alumina, were nominal during the year.

Mexico imported 577,000 forty-two-gallon barrels of crude oil but continued to be a net exporter of petroleum products. However, exports declined from 18.7 million barrels in 1963 to 17.2 million barrels in 1964. Annual exports of approximately 7 million barrels of low-grade asphaltic crude to the United States were expected to continue until facilities were installed in domestic plants to refine it in Mexico.

TABLE 2.—Mexico: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Alumina	5	9	Mainly to Colombia.
Bars, sheets, pipe and fittings, rods, wire and cable, structural shapes.	9	20	United States 15; British Honduras 2; Guatemala 1.
Antimony, content of:			
Ore	12, 062	11, 908	All to United States.
Mixed bars	172	201	United States 200; Nicaragua 1.
Refined bars	103	120	All to United States.
Arsenic oxide:			
Black arsenic	1, 994	127	Do.
White arsenic	6, 479	8, 652	Do.
Total	8, 473	8, 779	
Bismuth:			
Mixed bars	300	267	Do.
Refined bars	124	143	United States 95; United Kingdom 38; India 10.
Cadmium:			
Concentrate	45	----------	
Flue dust	1, 054	943	Mainly to United States.
Refined metal	28	148	United States 89; United Kingdom 38; France 10.
Copper:			
Ore	6, 957	1, 901	All to United States.
Concentrate, precipitate, matte, speiss, etc.	65	217	Do.
Sulfate	(1)	384	Brazil 319; United States 54; Venezuela 10.
Mixed bars	24, 435	22, 415	United States 20,576; Italy 1,575; Honduras 264.
Anodes and electrolytic copper	5, 009	2, 779	Brazil 1,619; United States 1,130; Argentina 30.
Copper, brass and bronze semimanufactures:			
Bronze ingots and bars	72	64	Colombia 54; Peru 5; El Salvador 2.
Plates, sheets, and structural shapes.	100	425	United States 344; Colombia 34; Venezuela 13.
Rods, wire, and cable	2, 095	1, 450	Colombia 486; Ecuador 187; Venezuela 173.
Tubes, pipe and fittings	302	231	Puerto Rico 62; Peru 54; Colombia 37.
Gold troy ounces	36, 435	29, 972	All to United States.
Iron and steel:			
Iron ore	147, 056	1, 112	Mainly to United States.
Scrap	1, 242	553	Do.
Ferroalloys:			
Ferromanganese	1, 400	1, 280	All to United States.
Silicomanganese	2, 243	2, 901	Do.
Other	1, 440	----------	
Total	5, 083	4, 181	
Pig iron	264	7	Do.
Steel:			
Ingots, blooms, billets, and forgings.	6, 978	259	El Salvador 101; United States 99; Brazil 59.
Semimanufactures:			
Bars	34	41	United States 28; British Honduras 7; Brazil 6.
Plates, sheets and strip	22, 593	112, 520	United States 79, 346; Brazil 24,742; Italy 6,839.
Tinplate	798	3, 167	Brazil 2,900; United States 23; Nicaragua 12.
Girders, beams, structural shapes.	56	251	Yugoslavia 105; Brazil 65; Peru 23.
Wire and cable	174	208	Chile 105; Colombia 50; Brazil 20.
Pipes, tubes, and fittings	17, 993	55, 966	United States 49,632; Peru 2,998; Venezuela 1,164.

See footnote at end of table.

TABLE 2.—Mexico: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals—Continued			
Lead:			
Ore, concentrate, matte, and speiss	4,413	2,940	All to United States.
Chloride	137	(1)	
Oxides:			
Litharge	20,704	26,463	United States 20,770; Italy 1,119; Venezuela 666.
Red lead	2,012	3,119	West Germany 843; United States 747 Netherlands 450.
Impure and mixed bars	10,575	11,941	United States 9,442 Netherlands 1,270.
Antimonial bars	341	374	Nicaragua 350; Honduras 5; United States 5.
Refined bars	123,507	124,398	United States 97,687; Belgium 4,926; India 3,960.
Manganese ore and concentrate	132,413	109,756	United States 109,455; Panama 220; Guatemala 80.
Mercury ... 76-pound flasks	21,734	18,863	United States 14,439; Japan 1,878; Brazil 1,547.
Molybdenum concentrate	113	67	France 31; Japan 25; United States 11.
Silver ... thousand troy ounces	33,545	46,127	All to United States.
Titanium oxide	153	1,002	Mainly to Chile.
Tungsten concentrate	61	86	All to United States.
Zinc:			
Ore, concentrate, slag, and other intermediate products.	358,768	357,431	United States 349,898; Japan 7,533.
Oxide, white	1,301	2,183	United States 2,144; Canada 29; Venezuela 10.
Sulfate	304	225	Mainly to United States.
Impure bars	----------	525	All to United States.
Refined bars	29,411	29,375	United States 13,261; Brazil 5,792 United Kingdom 3,458.
Other metals and metallic residues	25	706	Belgium 679; Netherlands 27.
Nonmetals:			
Abrasives:			
Emery ... kilograms	60	140	Guatemala 90; Panama 50.
Diamond, industrial ... carats	60,000	65,000	All to United States.
Pumice	1,606	6,480	Do.
Diatomite, infusorial earth, tripoli, and chalk.	185	163	Mainly to United States.
Asbestos	5	50	United States 47; Honduras 3.
Barite	219,741	146,688	All to United States.
Calcite, optical and industrial ... kilograms	6,216	4,337	United States 3,400; West Germany 930; Japan 7.
Cement, portland	13,104	10,930	Mainly to United States.
Clays and earths:			
Bentonite	1	622	Canada 530; United States 89; Colombia 2.
Other clays, including refractory	224	385	United States 275; Belgium 50; Colombia 37.
Earths, all kinds	2	4	All to United States.
Feldspar	(1)	259	Do.
Fluorspar:			
Acid grade	96,089	120,467	United States 120,294; Canada 173.
Metallurgical grade	372,215	389,802	United States 311,486; Canada 77,552; Netherlands 503.
Graphite, natural amorphous	30,218	29,890	United States 29,844; Japan 45.
Gypsum:			
Crude	638,858	1,060,180	United States 879,637; Canada 59,960; Japan 38,798.
Calcined	6	6	Guatemala 4; United States 1.
Lime	773	116	All to United States.
Limestone and dolomite	567	1,651	Mainly to United States.
Magnesite	50	----------	
Mica	7	----------	
Perlite	----------	173	Chile 164; United States 9.
Phosphate rock	27,727	23,969	Mainly to United States.
Quartz	4,295	2,534	United States 2,514; Belgium 19.
Salt ... thousand tons	1,064	1,004	Japan 591; United States 332.
Sand and gravel	1,474	2,128	United States 2,091; Colombia 5; Peru 9.
Sodium sulfate: Blödite and thenardite	20	(1)	
Stone, building and industrial:			
Alabaster and marble	7,253	6,890	United States 6,738.
Granite	70	8	All to United States.
Other types not specified	28,257	42,177	Mainly to United States.
Stones, semiprecious, uncut, agate, jasper, opal, and obsidian ... kilograms	10,104	99,399	United States 76,931; France 22,463; Japan 3.
Strontium minerals: Celestite	4,269	6,190	All to United States.
Sulfur ... thousand tons	1,331	1,507	United States 963; United Kingdom 162; Australia 90.
Talc and steatite	(1)	2	All to Chile.
Nonmetals, types not specified	47	(1)	

See footnote at end of table.

TABLE 2.—Mexico: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Mineral fuels:			
Coal, powdered	28	7	All to United States.
Natural gas ... million cubic feet	48,621	47,628	Do.
Natural gas liquids ... kilograms	221	262	Do.
Petroleum:			
Crude ... thousand 42-gallon barrels	7,376	7,026	Do.
Refinery products:			
Gasoline ... do	27	176	Brazil 151; Guatemala 25.
Distillate fuel oil ... do	73	317	United Kingdom 255; Guatemala 25; United States 15.
Residual fuel oil ... do	11,333	11,198	United States 11,071; Liberia 74; Greece 14.
Lubricants, including greases	235	257	United States 237; Colombia 20.
Asphalt	511	20	Mainly to Switzerland.
Paraffin and wax	1,606	1,691	United States 1,658; United Kingdom 33.

[1] Less than ½ unit.

Source: Anuario Estadístico del Comercio Exterior de los Estados Unidos Mexicanos, 1963. Direccion General de Estadística. Mexico, D.F., 1964.

TABLE 3.—Mexico: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Bauxite	7,363	5,954	All from United States.
Metal, all forms	23,224	23,719	United States 13,779; France 5,521; Canada 1,825.
Cobalt	7	11	Belgium 10; United States 1.
Copper (all forms including alloys)	440	777	United States 426; United Kingdom 241; France 43.
Iron and steel:			
Iron ore	6,019	2,103	United States 2,091; Venezuela 12.
Pig iron	(1)	38	All from United States.
Scrap	288,675	160,756	Do.
Ferroalloys	1,537	1,465	United States 1,071; Belgium 187; Luxembourg 67.
Ingots and equivalent forms	7	1	All from United States.
Semimanufactures:			
Railroad rails and accessories	60,545	56,946	Canada 54,950; United States 1,932; Belgium 49.
Other	35,682	38,232	United States 22,504; West Germany 4,557; France 3,118.
Total	96,227	95,178	
Magnesium	363	595	United States 392; Canada 200; United Kingdom 2.
Nickel	457	406	United States 294; Canada 87; West Germany 17.
Palladium ... troy ounces	3,688	3,441	United States 2,769; France 672.
Platinum ... do	149	115	United States 67; France 48.
Tin ... long tons	198	538	United States 384; United Kingdom 152; Netherlands 1.
Other: [2]			
Ores and concentrates	18,085	6,665	United States 6,513; Australia 152.
Metals	191	221	United States 104; West Germany 36; Sweden 33.
Nonmetals:			
Abrasives:			
Carborundum, ground	1,035	1,006	United States 605; Norway 106; Netherlands 91.
Diamond, industrial ... carats	172,405	168,190	United States 140,490; Netherlands 11,150; Belgium 10,700.
Asbestos	11,786	19,983	Canada 14,849; United States 4,179; South Africa 736.
Barite	671	556	United States 197; Netherlands 18 West Germany 134.

See footnotes at end of table.

TABLE 3.—Mexico: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals—Continued			
Clays:			
Fuller's earth	1,858	3,641	United States 2,627; West Germany 999; Netherlands 13.
Kaolin	8,432	10,103	United States 10,026; Czechoslovakia 60; West Germany 16.
Nonrefractory	4,254	3,708	United States 3,673; West Germany 15; Japan 14.
Refractory	40,947	55,927	United States 55,765; Belgium 81; West Germany 44.
Cryolite	13	1,977	United States 1,973; East Germany 4.
Diatomite	3,074	1,227	All from United States.
Feldspar	1,289	1,368	United States 1,349; Canada 19.
Graphite	84	61	United States 56; West Germany 5.
Gypsum	417	238	United States 236; United Kingdom 2.
Limestone	143	1,175	United States 716; Switzerland 404; United Kingdom 51.
Magnesite	8,354	57	United States 55; Netherlands 1.
Mica	620	574	United States 518; Argentina 44; Brazil 9.
Phosphate rock	128,211	199,256	All from United States.
Salt	1,087	1,250	United States 1,227; West Germany 23.
Sand:			
Glass	104,190	46,284	United States 46,196; Canada 47; Belgium 20.
Other	37	15	All from United States.
Talc	23,878	31,621	United States 30,895; Italy 725; Japan 1.
Mineral fuels:			
Coal	46,787	44,762	United States 44,758; Colombia 4.
Coke	9,167	21,245	All from United States.
Natural gas .... million cubic feet	9,620	9,386	Do.
Natural gas liquids .... thousand 42-gallon barrels	3,004	3,588	Mainly from United States.
Petroleum:			
Crude .... do	(1)	146	Mainly from Venezuela.
Refinery products:			
Aviation gasoline .... do	43	28	Netherlands 18; Trinidad 10.
Motor gasoline .... do	66	62	All from United States.
Kerosine .... do	3	1	Do.
Distillate fuel oil .... do	2	2	Do.
Residual fuel oil .... do	583	1,094	Do.
Lubricants including greases .... kilograms	17,489	9,065	United States 9,014; Sweden 43; West Germany 1.
Asphalt .... do	721	968	United States 944; United Kingdom 23; West Germany 1.
Paraffin, vaseline, and waxes .... do	20,095	25,376	United States 25,317; West Germany 37; Martinique 9.

[1] Less than ½ unit.

[2] Lead, zinc, molybdenum, tungsten, and various alloys.

COMMODITY REVIEW

METALS

Aluminum.—Production of ingot at Mexico's only aluminum smelter, located at Veracruz, was approximately 18,000 tons in 1964, the first full year of operation. The operator, Aluminio S.A. de C.V., announced that plans aimed at serving Latin American markets as well as providing for increasing domestic consumption, would require expansion of the smelter operation by at least 50 percent.[4]

Cadmium.—Approximate production of recoverable cadmium on a mine basis has not been presented for Mexico in previous volumes of the Minerals Yearbook. The estimates appearing in the production table for the years 1960–64 have been based on the Mexican mine production of recoverable zinc in ores mined and milled, with the knowledge that essentially all Mexican zinc sulfide ores contain cadmium and that over a 20-year period (1939–58) prior to the production of metallic cadmium in Mexico, cadmium was recovered in flue dust at an average ratio to refined zinc production of 0.01419 : 1, equivalent to 31 pounds of cadmium per metric ton of zinc. Therefore, it may be concluded that recoverable cadmium is contained in Mexican zinc concentrates at the same ratio to recoverable zinc. Assuming that 90 percent of the zinc in concentrates is recoverable as metal, and 95 percent of the cadmium in flue dust is recoverable as metal, and that *A* represents zinc smelter production and *B* represents the zinc content of zinc concentrates produced for export, then the recoverable content of cadmium in all the zinc concentrates produced should be approximately equal to:

---

[4] Howard, Hi. Increased Steel and Aluminum Output Planned for Mexico. American Metal Market, v. 72, No. 21, Feb. 1, 1965, p. 2.

$$090\ (0.\overset{\underline{A}}{90}+B)\times 0.01419\times 0.95, \text{ or } 0.0121\ (0.\overset{\underline{A}}{90}+B).$$

Without allowing for the presumably very small amounts of cadmium recoverable from the smelting of Mexican copper ores, the estimates derived from the above formula show Mexico to be easily the world's leading producer of recoverable cadmium on a mine (or more precisely a mill) basis, as it is the leading contributor to the dominance of the United States in the production of refined cadmium metal.

Copper.—Compañía Minera de Cananea, S.A. de C.V., a subsidiary of The Anaconda Co. and the largest producer of copper in Mexico, began installation of a three-flight, 48-inch-wide conveyor belt system 5,200 feet long, to transport ore from the new La Cananea open pit on the south slope of Sonora Hill.[5] The new pit was developed to mine an estimated 60 million tons of 0.78-percent copper ore.

The refinery of Cananea-owned Cobre de Mexico in the Federal District absorbed all of the blister copper produced by Cananea (estimated at nearly 30,000 tons), plus a portion of the blister customarily exported from the San Luis Potosí smelter of Asarco, to produce 13.6 percent more electrolytic copper than in 1963. Except for 630 tons exported in February, all the 34,867 tons of electrolytic copper produced and most of the accumulated stocks of Cobre de Mexico were sold in Mexico in response to an extraordinary increase in domestic demand. Nevertheless, 15,000 tons of blister which could have been refined in Mexico was exported. In view of the short supply of electrolytic copper, a quota system for manufacturers who use it was established in 1964. Between July and December, Cobre de Mexico expanded its monthly production capacity from 3,200 to 4,500 tons, and will be able to further increase this figure to 7,000 tons as required by the market demand.

Cía. Minera de Fresnillo announced the discovery of a copper deposit in the Sierra de Samalayuca, in the State of Chihuahua.[6] Preliminary studies indicated that an extensive deposit of low grade ore might be developed.

Gold and Silver.—Mexico continued as the world's largest producer of silver. Early in 1964, the national Compañía Minera la Bonanza, S.A., was formed to exploit old gold and silver mines in the State of Zacatecas.[7] The company had installed a 300-ton cyanide concentration plant about 3 miles from the city of Zacatecas, and by yearend processing of gold and silver ores from the old mines had reached approximately 150 tons per day. In the Los Pinos mining district about 120 kilometers southeast of Zacatecas, the company acquired 17 claims in the area that includes the old La Esperanza and Cinco Estrellas veins.

---

[5] World Mining. Cananea Installing Conveyor Belt System in Open Pit. V. 18, No. 1, January 1965, pp. 65, 66.

[6] World Mining. Mexico. V. 18, No. 2, February 1965, p. 62.

[7] The El Paso Times. New Mining Activity Seen as Key to Revitalize Mexican Regions. Feb. 10, 1965, sec. E.

Minera Metalúrgica la Occidente in Sinaloa, processed about 120 tons of silver ore a day in another old mining area, the Panuco district.[8]

A new mining company, Geomet de Mexico, to be operated by the officers of the National Medium and Small Miners Association, was organized to explore and develop tin and silver deposits in Zacatecas and Guerreo.[9]

Iron and Steel.—The Banco Nacional de Comercio Exterior, S.A. published a list of 92 Mexican ore deposits having combined estimated reserves of 570 million tons averaging 57 percent iron. The Bank stated that the 9 deposits thus far carefully investigated contain 376 million tons of ore averaging approximately 59 percent iron. This leaves 34 percent of the estimated national reserve distributed among 83 deposits. The iron ore in Mexico is to be reserved for and developed by Mexicans.

Pig iron production expanded by 10.1 percent above that of 1963 to 917,168 tons, the largest increase since 1961. Output of sponge iron increased 19.1 percent to a record high of 202,208 tons. Production of ferroalloys reached 42,568 tons, an increase of 64.2 percent above the 1963 level.

The rapid growth of the Mexican steel industry during 1959–64 was reflected in the rise in the production of ingot. In that 6-year period, total production of ingot was equal to the quantity produced during the preceding 55 years since the establishment of the industry in 1903. Despite this growth, it appears unlikely that Mexico will be free of its need to import substantial quantities of scrap and specialty iron and steel products by 1970 as anticipated by some members of the industry. In 1964 ingot steel capacity was approximately 2.7 million tons, about 15 percent above that of 1963. Production rose 12.2 percent to 2.26 million tons, while apparent consumption rose 25.9 percent to 2.48 million tons. Output from Altos Hornos de Mexico, the country's largest steel producer, was approximately 1 million tons of ingot. Expansion was underway in 1964 at the company's Monclova, Coahuila, mills to increase ingot capacity from 1.1 million tons to 1.5 million tons. The company purchased a 16-inch merchant bar mill in the United States for installation at its La Consolidada Lecherita plant in Mexico State to provide a wider range of steel sections and sizes than had been available from domestic producers.

Cía. Fundidora de Fierro y Acero Monterrey, S.A., Mexico's largest privately owned steel company, obtained a loan of $28 million from the Export-Import Bank of Washington, D.C., and another of $12.5 million from the National Bank of Mexico, to expand its 500,000-ton steel ingot plant to 750,000 tons. Equipment and technical assistance came from the United States.

---

[8] Mining Journal (London). Mexican Silver Mine. V. 263, No. 6743, Nov. 13, 1964, p. 359.

[9] Engineering and Mining Journal. Metal and Mineral Markets. V. 165, No. 11, November 1964, p. 162.

Siderurgica Nacional (Sidena), with a 4,000-ton iron and steel foundry at Shugan, announced that with the help of Vanadium Alloys Steel Co., Latrobe, Pa., it would erect and operate a new $4.5 million plant at Shugan to produce alloy and special steels.[10] The new facilities, including an electric furnace, would increase annual melting capacity by about 10,000 tons. Other equipment listed were three bar-rolling mills, a forging press, and heating, annealing, thermal treating, and finishing equipment. Some of the equipment was furnished by Vanadium's subsidiary company in Canada. Sidena was to have exclusive Latin American rights to produce the special steels.

Hojalata y Lamina, S.A., announced that Fierro Esponja, one of its Monterrey component companies, is to nearly double its production capacity by adding a $6 million sponge iron plant of 500 metric tons daily capacity.

Tubos de Acero de Mexico, S.A. (TAMSA), approached completion of its Mexico City plant-expansion project to 200,000 metric tons capacity for steel pipe per year, and broke ground for a stainless steel and molybdenum plant in Veracruz to produce 10,000 to 11,000 metric tons annually. A 40,000-ton sponge iron plant in Veracruz was scheduled for completion in 1966.

Bliss and Laughlin Latinoamericana, S.A., affiliate of Bliss and Laughlin Steel Company of Illinois, erected a plant in Mexico State to produce cold-rolled steel bars.[11] Starting capacity was 3,000 tons a year, with plans for eventual capacity of 20,000 tons.

Lead and Zinc.—Mine production of lead was 8 percent below that of 1963. This decrease and increased domestic consumption were reflected in a decrease of 31.2 percent in volume of 1964 exports.

In October, Zincamex S.A., the Government-owned zinc smelter at Saltillo, Coahuila, started production. Annual production capacity of the plant was reported at 30,000 tons of zinc metal, 240 tons of cadmium metal, and 60,000 tons of sulfuric acid. Built with the technical and financial assistance of the syndicat Belge d'Entreprises à l'Etranger (SYBETRA) metalworking complex of Belgium, the new plant was the first of its design in Mexico and the fourth largest zinc plant of its kind in the world.[12] Plans were underway to reopen the Proamo mine at Fresnillo, Zacatecas, with anticipated output of 1,800 tons per day of lead-zinc-silver ore.

NONMETALS

Barite.—Improved international prices of barite encouraged increased production, particularly in the barite region of Sierra Roque, Chihuahua.[13] The material produced there found a ready market in the Southern United States for use as a weighting agent in well-drilling muds.

---

[10] Mining Journal (London). New Equipment for Mexico. V. 263, No. 6745, Nov. 27, 1964, p. 401.

[11] International Commerce. Steel Expansion. V. 70, No. 49, Dec. 7, 1964, p. 37.

[12] Engineering and Mining Journal. Metal and Mineral Markets. V. 166, No. 1, January 1965, p. 75.

[13] Comercio Exterior de Mexico. More Barite Produced. V. 11, No. 4, April 1965, p. 11.

Cement.—During the period 1947–63, Mexico's consumption of cement increased at the annual rate of 7.4 percent mainly as a result of accelerated construction since the end of World War II.[14] Building construction continued to increase in 1964 at such a rate as to require cement producers to raise production 18 percent above that of 1963. The 22 plants had a total annual production capacity of 4.61 million tons, and by yearend expansion programs were underway to increase it by 1.5 million tons.

Installation of better equipment in some plants resulted in decreased requirements for fuel, one of the larger cost items in production. Cement factories were planned for Torreon, Coahuila, and Macuspana, Tabasco, to supply areas far distant from presently operating plants and save high transportation costs.

Fluorspar.—Production of 624,069 tons in 1964 was an increase of 30 percent above that of 1963. Mexico maintained its position as the leading producer with 19.9 percent of world output. The major portion of the mineral was exported to the United States.

The Government permitted the export of fluorspar only on issuance of an export license, required to assure the payment of taxes to help finance the operations of the Dirección General de Estadística.

In order to prevent wasteful depletion of resources by highgrading, Mexican law requires that every 3 years fluorspar producers must invest in exploration and development in amounts determined by a formula which involves, among other things, the individual company level of operation. Fifty percent of the determined amount must be spent in actual underground operations. The resulting addition to mining costs may eventually lead to a rise in sales prices and at the same time bring new marginal producers into the fluorspar picture. Many small-scale individual miners sell their raw product to larger firms. Aside from these small operations, the Camara Minera de Mexico (Mexican Chamber of Mines) has provided the following names and operating locations of fluorspar producers:

Company	Municipality and State	Installed annual capacity (metric tons)
	Acid Grade Fluorspar	
Fluorita de Mexico, S.A	Múzquiz, Coahuila	120,000
Reynolds Fluorspar, S.A.[1]	Cuatro Cienagas and Ciudad Acuña, Coahuila.	70,000
Minera Frisco, S.A	San Francisco del Oro and Santa Barbara, Chihuahua.	60,000
Fluoresqueda, S.A	Fronteras, Sonora (inactive)	40,000
Cía. Industrial de Fluorita, S.A	Parral, Chihuahua	NA
	Nacozari de Garcia, Sonora	NA
La Domincia, S.A. de C.V	Ciudad Acuña, Coahuila	60,000
Cía. Minera Rio Colorado, S.A	Victoria, Guanajuato	40,000

---

[14] Comercio Exterior de Mexico. Insufficient Supply of Cement To Cover Mexico's Potential Demand. V. 11, No. 4, April 1965, p. 10.

Company	Municipality and State	Installed annual capacity (metric tons)
Metallurgical Grade Fluorspar		
La Domincia, S.A. de C.V	Ciudad Acuña, Coahuila	25,000
Cía. Minera Rio Colorado, S.A	Victoria, Guanajuato, Ciudad Fernándes, San Luis Potosí.	25,000
Cía. Minera Las Cuevas, S.A	Zaragoza, San Luis Potosí	120,000
Fluorita de Rio Verde, S.A	Victoria, Guanajuato	75,000
Minerales Pennsalt, S.A. de C.V	Zaragoza, San Luis Potosí	60,000
Cía. Minera Los Cayos, S.A	Victoria, Guanajuato	35,000
Cía. Minera La Valenciana, S.A	Mapimí, Durango, General Cepeda, Coahuila, Rio Verde, San Luis Potosí.	15,000
Minera Potosina, S.A. de C.V	Asientos, Durango, Cedral, San Luis Potosí	(2)
Minerales y Productos Metalúrgicos, S.A	Rodeo, Durango	NA
Cía. Minera Beatríz, S.R.L. de C.V	Ocampo and Múzquiz, Coahuila	NA
Minerales de Fluorita, S.A. de C.V	Ciudad Acuña, Coahuila	NA
Ing. José Miquel Salcido Reyes	do	NA
Sr. Arturo Santiesteban Flores	do	NA
Cía. Minera Ocampo, S.A	Zaragoza, Coahuila	NA
Restauradora de Minas, S.A	Taxco, Guerrero (inactive)	NA

[1] Operates in the United States, using ore from areas listed under "Municipality and State." Capacity given is for Mexican mine production.

[2] Not given on a comparable basis with capacity of other companies; reported as about 8,000 tons per month of mill feed ore.

NA Not available.

Sodium Compound.—Construction of a caustic soda and chlorine plant was begun at the petrochemical complex at Pajaritos in the State of Veracruz.

Sulfur.—Although production of Frasch sulfur increased 12 percent above that of 1963, shipments reduced inventories by 375,000 tons, leaving yearend stocks of the two Mexican producers at approximately 225,000 tons.[15]

Pan American Sulfur Co., began expansion of its Jaltipan plant to increase daily production capacity from 4,000 to 5,000 tons by April 1965. The company continued preparations to start shipment of liquid sulfur early in 1965, which would obviate the need for a large inventory above ground. Construction of the company's chartered ocean carrier was nearing completion, as well as liquid-sulfur storage facilities at Antwerp and Immingham, England.[16]

MINERAL FUELS

Coal.—The two largest producers of coal and coke, Altos Hornos de Mexico, S.A., and Cía. Minera Asarco, S.A., reported a total of 10 mines in operation during 1964, with a total of 3,763 employees. Because of badly fractured seams in some of Asarco's deposits, much of the coal was hand cobbed. Coke was produced at Asarco's Rosita and Agujita plants. Use of coal gas was divided almost equally for smelting zinc and to produce coal and coke.

Petroleum and Natural Gas.—In 1964 Petróleos Mexicanos (PEMEX) drilled 631 wells compared with 554 in 1963, an increase of 13.9 percent.[17] Of the 631 wells drilled, 83 were exploratory and 548 were development wells. The 83 exploratory wells included 16 producers, 5 of which were oil and 11 were gas wells. Of the 548 development wells, 426 were producers: 342 oil and 84 gas wells. Reports showed that the average depth drilled in new-field wildcat wells in 1964 was 9,470 feet and that footage drilled totaled 5.51 million. As in previous years, exploratory drilling was concentrated along the coastal plain of the Gulf of Mexico. There were 74 rotary rigs in Mexico on December 31, 1964.

---

[15] Engineering and Mining Journal. Metal and Mineral Markets. V. 36, No. 10, Mar. 8, 1965, p. 8.

[16] Journal of World Sulphur. Mexico Sulfur Industry. No. 54, October 1964, pp. 12–15.

[17] Whink, Frederico Mina, Petroleum Developments in Mexico in 1964. Bull. Am. Association of Petroleum Geologists, v. 49, No. 8, August 1965, pp. 1102–1111.

In northeastern Mexico, seven new gasfields were discovered. Within the Tampico embayment, three oilfields were discovered, one of which adjoined the Isla de Lobos field that was discovered in 1963 on the extension of the Golden Lane trend. This brought the number of wells drilled in the Isla de Lobos area to eight wells with a cumulative production of 326,000 barrels of oil. In the Isthmus and Tabasco regions, 12 wildcat wells were drilled, but no new fields were discovered.

Production of crude oil and distillates reached a new high of 370,000 barrels daily in November. PEMEX began the expansion of its Salamanca, Guanajunato, refinery aimed at doubling its capacity of 40,000 barrels per day.[18] By the end of the year, however, Mexican refineries began reducing annual operation to 115 million barrels, and PEMEX canceled plans to build a refinery at Rosarita Beach.

The Government announced that the development of the chemical and petrochemical industry was one of the decisive factors in the growth of the national economy. Exclusive rights to the production of basic petrochemical products were held by PEMEX. With almost 50,000 employees in 1964, PEMEX was the largest company employer in Mexico. Late in 1964 the Government declared polyethylene to be a basic petrochemical and announced that PEMEX would start construction immediately of a plant at Reynosa, Tamaulipus, to produce 18,000 tons of low density polyethylene a year. In the Veracruz area, a new plant, jointly owned by PEMEX and E. I. du Pont de Nemours & Co., Inc., started production of tetraethyl lead, and Sales y Alcalis, S.A., started construction of a plant to produce ethylene near Minatitlan.

A mixed-capital corporation, Poli-Rey, S.A., was organized in 1963 by Imperial Chemical Industries Ltd. (ICI of Great Britain) and others, with PEMEX owning 33 percent, for the purpose of building a polyethylene plant in Mexico. The corporation was dissolved in 1964, but PEMEX retained some ICI technicians.

Negro-Mex., S.A., started expansion of its carbon black plant in the Salamanca area, from 15,000 to 25,000 tons a years.

SOURCE MATERIALS

The information contained in this chapter was supplied by the U.S. Embassy, Mexico City, Mexico, through the U.S. Department of State. It was supplemented by data from Revista de Estadística, November–December 1964 and January, February, and April 1965, and from articles and notes appearing in such trade and news media as the Engineering and Mining Journal, The Mining World, The Mining Journal (London), American Metal Market, and Comercio Exterior de Mexico, January and April 1965. Mexican Government sources are not permitted to release data showing the production of individual mines or companies.

---

[18] International Commerce. Mexico's In Fine Shape, v. 71, No. 15, Apr. 19, 1965, pp. 26–28.

The Mineral Industry of Central American Areas

By Frank E. Noe[1]

◆

Contents

Page
British Honduras 65
Costa Rica 66
El Salvador 72
Guatemala 79
Honduras 84
Nicaragua 89
Panama 94

BRITISH HONDURAS

THE only recorded mineral product of British Honduras continued to be limestone, from a single quarry, primarily for road construction. Gold and tin are encountered in negligible amounts, but there are no known commercially valuable deposits of industrial metals. British Honduras has a 15-year history of petroleum exploration, but the results have been disappointing.

The economy of this British colony is supported almost exclusively by lumbering, agriculture, and to a minor extent, fishing.

TABLE 1.—British Honduras: Mineral production

	1960	1961	1962	1963	1964
Limestone:					
Quantity[1] .... cubic yards	9,053	6,976	37,945	25,481	23,332
Value .... BH$	22,270	NA	88,375	73,310	58,797
Value, @ 1 BH$/0.70 US$ .... US$	15,589	NA	61,863	51,317	41,158

NA Not available.
[1] As reported in cubic yards; conversion factor to metric tons not available.

During 1964, Phillips Petroleum Co. increased its holdings to 1,305,000 acres under Oil Prospecting License and Lease, but no new exploration work was carried out. Phillips Petroleum abandoned its last exploratory well as a dry hole in 1963.

In December, British Honduras Shell Petroleum Co. obtained exploration licenses covering approximately 2,000 square miles of the continental shelf. The 1-year license is renewable for 1 year, and a seismic survey was planned for the area. Shell also entered into an agreement with Phillips whereby they could acquire an interest in about 382,000 acres of Phillips' offshore holdings by carrying out a specific work program. In 1958, Shell, in collaboration with the Gulf Oil Co., did exploratory drilling onshore.

---

[1] Latin America specialist, Division of International Activities.

Consumption of petroleum products within the country was estimated at 503 barrels per day, as compared with 496 barrels per day in 1963.

The latest available trade statistics of British Honduras are for 1963. During that year, 153 tons of iron and steel scrap was the only recorded mineral export. (In 1962, 127 tons of ferrous scrap was exported.) Imports of metals and minerals were confined mostly to manufactured goods. In 1963, total imports were equivalent to U.S. $19 million, with chemicals including fertilizers valued at US$1.5 million, and mineral fuels valued at US$1 million.

TABLE 2.—British Honduras: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Iron and steel semimanufactures	2,490	1,727	United Kingdom 745; United States 370 Belgium 292.
Nonferrous semimanufactures	----------	29	United Kingdom 17; United States 8.
Nonmetals:			
Cement	7,182	7,697	Jamaica 3,711; Honduras 3,628.
Fertilizers:			
Nitrogenous	NA	1,589	Trinidad 816; West Germany 343; Belgium 177.
Phosphatic	NA	307	Mainly from United States.
Potassic	NA	263	Mainly from West Germany.
Mixed	NA	168	United States 95; West Germany 69.
Other, not specified	NA	724	Mainly from United States.
Total	1,568	3,051	
Lime	84	162	United States 84; United Kingdom 77.
Salt	509	623	Canada 375; United Kingdom 203.
Mineral fuels:			
Coal and coke	29	15	United Kingdom 8; United States 7.
Natural gas liquids	686	261	Mainly from Mexico.
Petroleum thousand 42-gallon barrels refinery products	192	208	Trinidad 98; United States 59; Aruba 50.
Road oil and asphalt products	524	1,430	Mainly from Trinidad.

NA Not available.

COSTA RICA

The position and importance of mineral industries to the Costa Rican economy in 1964 was somewhat difficult to assess. Mining and quarrying provided employment for about 0.2 percent of the estimated 419,000 economically active Costa Ricans, and provided about 300,000 tons of nonmetals valued at $7 million.[2] With the exception of a small quantity of gold, there were no metallic minerals mined, and the value of fertilizer production was included with other manufactured products. The ten-fold increase in value of reported mine production over the value of approximately $700,000 reported in Volume IV of the Minerals Yearbook for 1963 was due primarily to the inclusion of production and value data for sand, gravel, broken stone, crushed rock, and cement. Most of these construction materials also were produced prior to 1964, but data on output was not collected or reported, making it difficult to determine the contribution of the mineral industry to the gross national product which in 1963 was $510 million and in 1964 an estimated $550 million.

---

[2] Where necessary, values have been converted from colones (₡) at the rate of ₡6.65=US$1.00.

Mining activities in Costa Rica have never been large, although the mining field has attracted a disproportionate amount of promotion and investment. Known minerals are gold, diatomaceous earth, galena, sphalerite, limestone, calcite, kaolin, bauxitic laterities, and titaniferous iron sands. Problems in developing mineral resources in Costa Rica have included transportation difficulties, the small size of most ore-bearing strata, incomplete geological information, and the low grades of known mineral occurrences.

GOVERNMENT POLICIES AND PROGRAMS

The agriculture and livestock sectors of the Costa Rican economy have been much more important than manufacturing and commerce, although in recent years the latter groups have shown gains in both relative and absolute terms. Mining also has been of small importance, but it too has begun to attract the interest of foreign and domestic investors. The vast majority of industrial and manufacturing enterprises are privately owned by Costa Ricans. Although direct foreign investments in industry are of minor importance quantitatively as compared to domestic investments, enterprises with foreign capital include some of those most significant to the local economy. Government has not entered manufacturing to a significant degree, preferring to encourage private development in this sector of the economy. The majority of direct foreign investment, estimated in 1963 to be $100 million, is of U.S. origin. Preliminary U.S. Department of Commerce, Office of Business Economics, figures for U.S. investments in Costa Rica, 1962, indicated a total of $63 million, distributed primarily in agriculture, manufacturing, petroleum, and mining ($44 million); public utilities ($14 million); and trade ($5 million). Other major sources of investment capital have been Great Britain, France, and the Federal Republic of Germany. With the growth of the Central American Common Market movement, there has been increasing interest in the country by other Central American investors and, to a lesser extent, by private investment from other Latin American nations.

Within the last few years, the Government has sought to foster industrial growth by providing certain duty exemptions and tariff protection to new industry, and by making limited credit available at low interest rates. Incentives to industry have been granted under special legislation since 1940. The presently effective law, passed in 1959, is broader in scope than the 1940 decree it replaced. Costa Rica has signed the Uniform Central American Regime of Fiscal Incentives to Industrial Development, which will supersede the 1959 law. The Uniform Central American Industrial Development Law combines features of the individual laws it supersedes, and provides for tax relief, import duty exemptions, and other provisions common to such laws. It does not discriminate against foreign capital.

Because the country's mining code applied basically to gold mining and was not conducive to new investment for large-scale mining operations, the legislative assembly, after long debate, enacted an amendment to the mining code designed to permit and regulate low-grade aluminum-ore mining operations, making it possible for interested parties to begin negotiations for large-scale exploitation of bauxite deposits.

The Costa Rican Government also requested the United Nations Special Fund to provide $582,700 of a $1,037,600 3-year comprehensive mineral survey; Costa Rica agreed to cover local costs. The dollar contributions of the United Nations would be utilized for equipment and for the salaries of foreign specialists who would work with the small but active Department of Geology, Mines, and Petroleum of the Ministry of Industries.

PRODUCTION

Except for salt and cement, the Costa Rican Government has made no attempt to account precisely for the mineral production of the country. The other figures presented in the production table are rounded estimates. Figures for cement and limestone reflect entry into production of the modern National Cement Factory which has its own adjacent source of limestone. The factory reported production of 106,209 tons of limestone for its own use. The increased production of diatomaceous earth reflects the signing of a contract under the Industrial Encouragement Law for the expansion of operations at the diatomite deposits.

TABLE 3.—Costa Rica: Approximate production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Gold • ....troy ounces..	3,000	3,000	3,000	3,000	3,000
Manganese ore............	---------	---------	---------	600	---------
Nonmetals:					
Cement............	---------	---------	---------	---------	37,000
Diatomite •............	2,200	650	750	1,900	3,600
Lime •............	3,800	3,800	3,800	5,000	6,500
Limestone •............	23,600	24,800	25,600	30,000	126,200
Salt............	12,700	11,500	8,950	5,698	20,000
Sand and gravel............	NA	NA	NA	NA	• 50,000
Stone, crushed and broken............	NA	NA	NA	NA	• 50,000

• Estimate. NA Not available.

TRADE

Costa Rica has been an exporter of agricultural products almost exclusively, while manufactures, chemicals, petroleum, and foodstuffs have been the major components of the country's import trade. Unadjusted foreign trade figures released by the Dirección General de Estadísticas y Censos showed exports of $113 million in contrast to imports of $142.5 million. The United States, the principal trading partner of Costa Rica for many years, purchased approximately 48.5 percent of Costa Rican exports. Central Bank statistics reflect a significant rise in Costa Rican exports of industrial goods to the other

Central American Common Market (CACM) countries, and it appears that Costa Rica's trade with the rest of the Common Market has grown more rapidly than that of any other member. A preliminary breakdown of the country's export figures by commodity groups indicates that traditional agricultural exports accounted for approximately 80 percent of the total. Goods manufactured or assembled in the country represented approximately 13 percent of total exports, leaving 7 percent in exports of all other miscellaneous commodities. For the first time, fertilizers, previously a major import item, were produced within the country and a small surplus exported to other CACM countries. The value of fertilizer exports during the period July–December 1964 was $2.9 million.

The United States also was the principal source of Costa Rican imports and accounted for approximately 44 percent of the country's total imports. West Germany and Japan also were important sources of imports. Petroleum products were the most important mineral import in 1964, followed closely by common metals and nonmetallic mineral manufactures. The total value of petroleum products imported in 1964 was $7,975,600 of which $1,867,334 or 23.4 percent represented the United States' share of the market. The total 1964 value of petroleum product imports increased by $622,678 or 8.5 percent compared to 1963. There were no imports of crude and partially refined petroleum products registered during the year.

TABLE 4.—Costa Rica: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Gold ---- troy ounces	----	129	All to West Germany.
Iron and steel, all forms [1]	37	10	Japan 7; Nicaragua 3.
Zinc and alloys	----	12	Nicaragua 10; Columbia 2.
Nonferrous metals and alloys, all forms.[1]	(2)	17	Netherlands 11; Guatemala 6.
Nonmetals:			
Clay and clay products	61	61	Nicaragua 59; El Salvador 2.
Fertilizer, manufactured	----	8,193	Spain 6,700; El Salvador 993; Nicaragua 153.
Stone:			
Dimension	155	30	All to Nicaragua.
Industrial	1	1	All to El Salvador.

[1] Ingots and/or semimanufactures only in 1962; scrap included in 1963.
[2] Less than ½ unit.

TABLE 5.—Costa Rica: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys, all forms	400	518	United States 151; Japan 82; West Germany 49.
Copper and alloys:			
Sulfate	159	11	Belgium-Luxembourg 7; France 2.
Metal, all forms	215	246	Mexico 79; Chile 59; United States 45.
Gold ---- troy ounces	322	96	All from West Germany.
Iron and steel:			
Ingots and equivalent forms	1,740	6,664	West Germany 5,328; France 978.
Semimanufactures	20,884	29,437	Japan 9,907; Belgium-Luxembourg 6,688; West Germany 4,929.
Scrap	(1)	4	Panama 2; United States 2.

See footnote at end of table.

TABLE 5.—Costa Rica: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Lead and alloys, all forms	55	205	West Germany 163; Denmark 21; United States 16.
Nickel and alloys, all forms	5	5	United Kingdom 3; West Germany 1.
Platinum group metals and alloys, all forms ... troy ounces	----------	1,157	All from United States.
Silver and alloys ... do	514	1,961	United States 1,704; West Germany 193.
Tin and alloys, all forms ... long tons	10	16	United States 11; West Germany 2.
Zinc and alloys, all forms	48	381	Belgium-Luxembourg 318; Nicaragua 52.
Other:			
Nonferrous ore and concentrates, not further classified	1	3	United States 2; West Germany 1.
Nonferrous metals and alloys, not further classified	3	2	Mainly from United Kingdom.
Nonmetals:			
Abrasives, natural	9	46	United Kingdom 38; Italy 8.
Asbestos	24	32	United States 20; Belgium 5; West Germany 5.
Cement:			
Asbestos	1,184	1,582	Colombia 633; El Salvador 615; Belgium-Luxembourg 126.
Portland	81,884	87,961	Colombia 32,307; Venezuela 31,735; West Germany 20,424.
Clay and clay products:			
Kaolin	869	1,222	United States 1,001; United Kingdom 181.
Refractory and common	91	215	United States 112; United Kingdom 103.
Nonrefractory brick	7	3	Mainly from United States.
Refractory brick	77	372	United States 359; Mexico 12.
Diatomite	14	385	United States 381; West Germany 3.
Feldspar, fluorspar, and cryolite	14	14	All from United States.
Fertilizers:			
Nitrogenous	16,879	11,672	West Germany 9,571; United States 1,074.
Phosphatic	8,816	393	West Germany 184; United States 128.
Potassic	3,048	683	West Germany 592; Netherlands 91.
Mixed	33,395	52,018	West Germany 24,501; United States 13,864; Netherlands 11,793.
Graphite	1	2	Mainly from West Germany.
Gypsum:			
Crude	6	4	Do.
Calcined	151	158	West Germany 144; United States 6.
Lime, all types	109	10	All from United States.
Marble	32	117	All from Italy.
Mica	14	3	All from United States.
Pigments, mineral	318	(1)	Mainly from Belgium-Luxembourg.
Quartz	1	1	Mainly from West Germany.
Salt, all forms	96	105	United States 97; Nicaragua 5.
Sodium carbonate	404	487	United Kingdom 318; United States 88.
Sodium hydroxide	970	1,108	United Kingdom 452; West Germany 345; United States 280.
Stone:			
Dimension	130	54	Mainly from Italy.
Industrial, type not specified	1	(1)	All from West Germany.
Sand, gravel, crushed rock	5	60	All from United States.
Sulfur	10	45	Do.
Talc	84	135	Italy 84; France 27; United States 15.
Mineral fuels:			
Coal, all types	38	37	All from United States.
Coal and coke briquets	9	16	All from West Germany.
Coke	80	151	West Germany 65; Netherlands 65 United Kingdom 16.
Mineral tars and products	33	56	Mainly from United States.
Natural gas liquids	1,937	1,568	Mainly from Venezuela.
Petroleum:			
Crude and partially refined	12,506	15,312	Venezuela 9,302; Netherlands Antilles 6,009.
Refinery products:			
Gasoline	57,928	63,017	Netherlands Antilles 34,743; El Salvador 11,951.
Kerosine	13,264	13,613	Netherlands Antilles 9,188; Venezuela 1,982.
Distillate fuel oil	93,111	101,568	Netherlands Antilles 53,030; Venezuela 28,402; Trinidad 10,364.
Lubricants including greases	8,142	10,629	Mainly from United States.
Paraffin, vaseline, and waxes	1,866	1,746	Do.
Asphalt and coke	4,997	2,887	Mainly from Venezuela.

---

[1] Less than ½ unit.

COMMODITY REVIEW

Metals.—*Bauxite.*—The amendment to the Costa Rican mining code became law on August 25, 1964. After intensive discussions, on December 4 the Government and the Aluminum Co. of America (Alcoa) signed a special contract for the extraction of bauxitic laterite in a 250-square-kilometer area in the Valle del General. The contract authorized a 5-year exploration period and a 20-year exploitation period, and may be renewed for an additional 25 years. Alcoa will be required to restore lands to the condition prior to mining, and will make payments to owners, to the local government, and to the central government. Alcoa will build an ore-loading facility on the Pacific at Punta Uvita and a road connecting the valley to the facility. When fully in operation, the concession will employ 1,000 laborers and produce an estimated 500,000 tons of laterite each year. The ore body is a gypsitic trihydrate containing 35 to 40 percent Al_2O_3 and 6 to 7 percent SiO_2.

Iron and Steel.—In 1962 the Companía de Hierro del Pacifico, S.A., (Pacific Iron Co.; PICO) was established, according to newspaper reports, for the purpose of exploiting iron-bearing beach sands on the Pacific coast and for treating the iron concentrate obtained from these sands in a plant to produce iron and steel ingots and bars. Financing was to be provided by the Latin American Land and Development Co. and Coutinho, Caro, and Co. The newspapers also reported that the Latin American Land and Development Co. would finance studies by Costa Rican technicians and the Meissner Engineers Co. of Chicago to determine the physical and economic possibilities of the project. Plans called for access road and plant site work to begin in early 1963. However, additional feasibility studies to develop the information necessary for major investment were still being conducted in 1964. The Central American Bank for Economic Integration (CABEI) was financing a survey of iron-ore reserves contained in the titaniferous iron sands of the Gulf of Nicoya beaches and also an evaluation of the methods of processing magnetic sands with particular attention to the method proposed by PICO. In addition to the ore-bearing deposits between Punta Caldera and Punta Leone, there are other deposits which extend along the Pacific coast to Quepos. On the Caribbean shore line, particularly in the Puerto Viejo area of Limón province, deposits reported to contain about 8 million tons of titaniferous iron sands have been known for some time.

Manganese.—United States and Costa Rican interests planned to establish a shipping facility on the Pacific coast and to buy manganese ore from some 100 small mines in Nicoya Peninsula near the facility. Investment and working capital is being sought for this medium-sized project.

Nonmetals.—*Cement.*—The National Cement Plant began production in June and at yearend was in a position to supply all Costa Rican needs for portland No. 1 cement. The company has its own adjacent limestone quarry, and clays used in the process are found with the limestone; gypsum, however, was being imported from Nicaragua as all efforts to discover economically exploitable local deposits were unsuccessful.

Mineral Fuels.—*Petroleum.*—In September the Compañía Petrolera de Costa Rica, Ltda., of which Caribbean Gulf Oil Co. was the principal shareholder, transferred its entire Costa Rican concession interest to the Compañía para la Exploración y Explotación de Petróleos en Costa Rica, S.A. Caribbean Gulf had drilled seven unproductive wells since 1961 with an expenditure of more than $15 million. After completing two dry holes in the Baja Talamanca region of southeastern Costa Rica in 1963, the corporation decided to discontinue explorations in January 1964.

On April 1, Refinadora Costarricense de Petróleo broke ground at Moin, near the Atlantic port of Limón. The company is composed of local interests (55 percent), the Costa Rican Government (30 percent), and Allied Chemical Corp. (15 percent). The refinery will have an initial installed capacity to process 8,000 barrels of crude oil daily and is expected to go on stream the latter part of 1965.

Consumption of petroleum products during the year were estimated at 4,490 barrels per day as compared with 3,649 barrels per day in 1963. Bunker sales were 100 barrels per day compared with 80 barrels per day in 1963.

SOURCE MATERIALS

Information contained in this chapter was obtained from airgrams of the U.S. Embassy in San José, Costa Rica, and from Overseas Business Reports of the Bureau of International Commerce, U.S. Department of Commerce; the trade statistics presented in the accompanying tables are those officially published in Comercio Exterior de Costa Rica, Años 1962 y 1963, published by the Dirección General de Estadísticas y Censos, Ministerio de Economia y Hacienda, San José. Additional information was obtained from the reference study, Costa Rica, prepared by Industrial Development, and petroleum details were obtained from Bulletin of the American Association of Petroleum Geologists, Petroleum Management, and World Petroleum.

EL SALVADOR

El Salvador, geologically about 90 percent of volcanic origin, is poorer than its Central American neighbors in mineral resources. Although there are known mineral occurrences of gold, silver, copper, lead, zinc, and titaniferous beach sands, there has been no metallic mineral production reported since 1960. The mineral production of El Salvador from indigenous raw materials in 1964 was restricted to nonmetals for the construction industry and salt recovered from sea water. The reported value of the nonmetals produced was approximately $3.7 million,[3] 86 percent more than in 1963. In addition, a petroleum refinery inaugurated in 1963 for the treatment of imported crude oil had an output of refined products with a gross value of $10.3 million as compared with $7.8 million in 1963. A small amount of metal products was produced from imported raw materials such as pig iron, aluminum ingots, and various forms of lead and copper.

---

[3] Where necessary values have been converted from El Salvadoran Colones (₡) at the rate of ₡1=US$0.40.

However, most of the requirements for metals, nonmetals, and mineral fuels were imported.

GOVERNMENT POLICIES AND PROGRAMS

The Government of El Salvador, acutely aware of its basic mineral limitations, has not abandoned hope of developing what mineral resources do exist. The Center for Geotechnical Studies and Investigations, a subdivision of the Ministry of Public Works, became the center for public mineral resources development in 1964. Formerly called the National Geological Service (NGS), the Center acquired its present name when the NGS was reorganized at the beginning of the year. The Center is headed by a director responsible to the Minister of Public Works and is subdivided into five offices: Geology, petroleum and mining, seismology, soils, and construction materials. Throughout the year the Center was actively engaged in the planning and initiating of two principal projects: Preparation of a geologic map of the Republic on a scale of 1:200,000, and intense exploration for minerals in all promising areas, estimated at some 7,000 square kilometers. It was anticipated that the preparation of the geologic map would take approximately 2 years with the assistance of two German geologists on loan to the Center under technical assistance agreement with West Germany. The special fund of the United Nations was requested to supply technical assistance for an exhaustive mineral exploration project. It was estimated that this project would take 3 years beginning in 1965, and would result in the definition of all mineral occurrences by location, magnitude, quality, and grade. A general inventory of physical resources under preparation for El Salvador by the U.S. Army Map Service, under the auspices of the Agency for International Development, was completed by yearend, but publication was not expected until early in 1965. Previous geological surveys have indicated that there are no commercial oil or coal supplies in El Salvador. In keeping with Latin American tradition, subsoil rights under the mining code are vested in the State. Inasmuch as El Salvador has few mineral resources, it will have to forego primary industries unless its basic raw materials are imported. Therefore, El Salvador has concentrated on industries using imported raw materials as, for example, the oil refinery at Acajutla which imports crude oil from Venezuela, and the aluminum extrusion plant in San Salvador which imports aluminum ingots from Canada.

To attract new industries to El Salvador, the Government has provided incentives to new and expanding industries in the form of concessions on taxes and import duties. The Government has also been actively promoting economic development through the Industrial Development Institute (Instituto Salvadoreno de Fomento Industrial, INSAFI). INSAFI was formed to better promote industrial development, and to extend industrial financing to private Salvadoran, mixed, and foreign industry in that country. The agency has assisted potential local and industrial investors with lists of feasible industries for the country as well as literature on investment incentive and exchange control legislation, industrial statistics, and other general investment information. INSAFI has also acted as an industrial bank, and makes loans on a short, medium, or long term basis for private industrial development projects. Joint ventures with foreign companies have also been undertaken with the understanding that the shares later will be sold to the private sector. An outstanding example of this has been INSAFI's joint venture with Phelps Dodge in establishing Phelps Dodge de Centroamerica, S.A. which began production of copper and aluminum wire and cable in San Salvador early in 1964. The company was established late in 1962 with a capital of approximately $2 million obtained from the following sources: INSAFI, $600,000; Phelps Dodge Copper International Products Corp., $600,000; Central American Bank for Economic Integration, $700,000; and local Salvadoran banks, $100,000. After 2 years, the $600,000 interest of INSAFI was to be placed on sale to the public in the form of stocks and bonds. As of January 1963, loans totaling $6.0 million had been made by INSAFI to 360 borrowers, while in 1964 the value of loans granted by the Institute totaled $4.5 million. As an additional incentive to potential investors and to facilitate national development, the Government has been working also to create a more equitable tax structure.

PRODUCTION

The production of limestone, for use in the manufacture of lime and cement in the country's only cement plant at Acajutla, decreased considerably from that in 1963, and amounted only to about 42,000 metric tons. This material was augmented by 44,000 tons of sea shells from an unspecified location. A record production of salt was recovered from salinas for local domestic and industrial consumption and for export. Although complete figures for production of other industrial minerals have not been collected by the Government, it is known that sand, gravel, gypsum, pumice and slatelike sedimentary rock have been regularly mined and consumed by domestic industry. The Refineria Petrolera Acajutla, S.A. completed its first full year of operation with the production of 3,264,000 barrels of petroleum products as compared with 1,785,000 barrels produced in the partial year of 1963.

TABLE 6.—El Salvador: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Gold____troy ounces	[1] 1,121	----------	----------	----------	----------
Silver____do	[1] 76,809	----------	----------	----------	----------
Nonmetals:					
Cement	85,214	73,283	63,834	[r] 85,456	88,278
Lime	NA	610	645	[e] 650	NA
Limestone and sea shells	[r] 127,885	96,200	[r] 113,316	107,100	86,711
Salt: Marine (crude)	14.000	15,000	18,140	[e] 18,000	25,000
Mineral fuels:					
Petroleum refinery products:					
Motor gasoline__thousand 42-gallon barrels	----------	----------	----------	793	1,024
Kerosine____do	----------	----------	----------	124	238
Distillate fuel oil____do	----------	----------	----------	644	851
Residual fuel oil____do	----------	----------	----------	211	1,119
Liquefied petroleum gas____do	----------	----------	----------	13	32
Total____do	----------	----------	----------	1,785	3,264

[e] Estimate. [r] Revised. NA Not available.

[1] One mine produced until May 1960 and has not resumed operations.

TRADE

El Salvador foreign trade reached record levels in 1964; according to preliminary information released by the Director of Statistics and Census, total exports amounted to $178 million or 15.8 percent above the 1963 figure, while imports totaled $191 million, a 25.9 percent increase over 1963. However, for the second time since 1957, El Salvador had a negative trade balance. In 1960, there was a negative balance of $5.6 million, and in 1964 the negative trade balance was $12.9 million. Manufactured goods continued to be the major import class although its relative importance has decreased from 38.3 percent of total imports in 1957 to 31.9 percent in 1964. The dollar value of these imports increased $17 million during the comparative period. It should be noted, however, that many commodities included in this category were parts to be used in assembling, formative, or construction industries. Approximately 10 percent of the above value figure is represented by iron and steel and 11 percent by products of other metals. Information available does not show the imports of individual commodities. Imports of petroleum and petroleum products increased from $7 million in 1957 to $13 and $12 million in 1963 and 1964, respectively. Their share of total value of imports, however, has changed very little. In 1957 the larger portion of this type of commodities was represented by gasoline, kerosine, diesel oil, and other finished products, while in 1964 the major portion was represented by crude oil to be refined in the country. The second highest import class in El Salvador's foreign trade has been equipment and machinery, while chemicals constitute the third highest import class. Imports of chemicals increased from $17.9 million in 1957 to $36.8 million in 1964. Fertilizers comprised about 32 percent of the imports in this category. The United States has been the principal supplier to El Salvador although the U.S. share has decreased considerably since 1957 at which time the U.S. supplied 51.5 percent of total imports as compared with only 34.8 percent in 1964. Other Central American Common Market (CACM) countries furnished 20.5 percent of imports in 1964 as compared with 7.5 percent in 1957. Other important suppliers to El Salvador are West Germany and Japan with 7.9 and 6.7 percent, respectively, of total import value.

Exports of petroleum and petroleum products jumped from nothing in 1957 to $5.2 million in 1964, the equivalent of 2.9 percent of total Salvadoran exports. U.S. exports decreased from 45.7 percent of the total in 1957 to 25.5 percent in 1964. For the second successive year, the U.S. was not the principal market for Salvadoran exports but ranked behind West Germany who purchased 26.1 percent of goods exported. In 1963, Japan had been the leading destination of exports with the U.S. second and West Germany third. Exports to other countries of the CACM increased from $6 million or 4.6 percent in 1957 to $36.8 million or 20.7 percent in 1964. El Salvador in 1964 continued the role it has played in the past of being the leading trader in the CACM. Total trade, however, has so greatly increased among the Central American countries that although El Salvador's trade has increased in absolute terms, her percentage of the total was reduced to 32 percent of exports and 36 percent of imports, as compared with 36 percent and 42 percent in these same categories in 1963. Guatemala and Honduras, the two adjacent countries, continued to be El Salvador's best trading partners in the CACM. In the field of mineral industries, petroleum product exports to CACM countries increased in value $1.1 million while showing a decline of 2 percent in share of the total exports, and the importation of chemical products, mainly fertilizer materials, increased from 7.5 percent of the total imports in 1963 to 18.1 percent in 1964.

TABLE 7.—El Salvador: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Copper and alloys, all forms [1]	28	(2)	All to United States.
Iron and steel:			
Scrap	242	19	United States 16; Honduras 3.
Primary forms and semimanufactures [1]	380	556	Honduras 458; Netherlands 85.
Silver:			
Ore and concentrate	----------	17	All to United States.
Metal and alloys ...... troy ounces	----------	3,385	Do.
Other nonferrous metals:			
Scrap [1]	91	45	United States 33; Japan 12.
Other	7	----------	
Nonmetals:			
Cement:			
Asbestos	1,917	2,240	Honduras 1,188; Costa Rica 584; Nicaragua 356.
Portland	3,723	5,013	Honduras 4,901; Nicaragua 110.
Clay and clay products: Common brick	179	56	Honduras 50; Guatemala 6.
Fertilizers, manufactured [1]	333	348	Honduras 318; Guatemala 30.
Lime	62	77	Mainly to Honduras.
Marble [1]	1	1	Mainly to Guatemala.
Salt	1,951	1,918	Honduras 1,552; Nicaragua 331.
Stone:			
Dimension	17	19	All to Nicaragua.
Industrial	----------	5	Honduras 3; Nicaragua 2.
Other nonmetallic minerals	38	3	All to Honduras.
Mineral fuels:			
Coal, all types [1]	3	1	All to Nicaragua.
Petroleum:			
Refinery products [1]	5,310	200,706	Guatemala 163,115; Costa Rica 20,283; Honduras 14,429.
Gas liquids [1]	----------	227	Honduras 188; Guatemala 39.

[1] Includes reexports of "nationalized" goods, defined as those materials upon which import duties have been paid.
[2] Less than ½ unit.

TABLE 8.—El Salvador: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys:			
Unwrought	185	614	United States 520; Canada 94.
Semimanufactures	228	330	United States 119; West Germany 59; United Kingdom 35.
Copper and alloys:			
Sulfate	2	8	United States 3; West Germany 3; United Kingdom 2.
Metal, all forms	92	104	United Kingdom 35; United States 32; Canada 15.
Iron and steel:			
Pig iron, ferroalloys, and scrap	455	480	Honduras 305; United States 133; Belgium 25.
Ingots and equivalent primary forms	48	342	Belgium 298; United Kingdom 39.
Semimanufactures	22,999	32,204	Belgium 12,118; United States 8,017; West Germany 3,502.
Lead and alloys:			
Unwrought	37	102	Mexico 78; United States 13; West Germany 10.
Semimanufactures	158	91	Belgium 48; Guatemala 24; United States 10.

See footnote at end of table.

TABLE 8.—El Salvador: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Platinum-group metals..troy ounces..	32	71	Mainly from France.
Silver and alloys.....do....	4,244	10,079	United States 5,797; Mexico 2,163; France 2,029.
Tin and alloys:			
Unwrought.....long tons..	3	4	United States 3; United Kingdom 1.
Semimanufactures.....do....	31	12	Mainly from United Kingdom.
Zinc and alloys, all forms	25	61	Nicaragua 48; Guatemala 6; United States 5.
Nonmetals:			
Abrasives, natural:			
Diamond, industrial.....carats..	----------	150,000	Belgium 135,000; West Germany 15,000.
Pumice, emery, and corundum	3	1	Mainly from West Germany
Tripoli	----------	1	All from United States.
Asbestos:			
Crude, washed or ground	413	840	Mainly from Canada.
Plates, sheets and cord	4	106	Guatemala 70; United States 35.
Cement:			
Asbestos	409	383	Guatemala 215; Honduras 98; United States 70.
Portland	24,642	39,445	Guatemala 19,710; Honduras 18,325.
Clay and clay products:			
Kaolin and clayey earths	242	367	Guatemala 184; United States 178.
Refractory earths and rocks	46	49	United States 34; Netherlands 8.
Common brick	16	101	Mainly from Guatemala.
Refractory brick	320	291	United States 234; Guatemala 26.
Diatomite	238	337	United States 286; West Germany 38; Guatemala 12.
Feldspar, fluorspar and cryolite	----------	1	All from United States.
Fertilizers:			
Nitrogenous	52,234	78,278	Netherlands 34,156; West Germany 26,896; Belgium 7,307.
Phosphatic	1,160	1,406	West Germany 699; Belgium 550; United States 157.
Potassic	917	1,147	Mainly from West Germany.
Mixed	21,051	34,450	West Germany 14,493; United States 12,385; Netherlands 6,826.
Graphite	1	1	Mainly from Italy.
Gypsum:			
Crude	1,405	1,014	All from Guatemala.
Calcined, powder	35	49	United Kingdom 21; West Germany 17 United States 8.
Lime, all types	542	744	Guatemala 657; United States 86.
Marble	330	1,271	Guatemala 1,258; Italy 11.
Mica	7	9	All from United States.
Pigments, mineral	1	1	Mainly from Netherlands.
Salt, all types	1,752	2,855	Honduras 2,802; United States 41.
Sand, gravel, and crushed rock	21	49	West Germany 12; Italy 10; United States 9.
Sodium carbonate	101	151	West Germany 88; United Kingdom 36; United States 17.
Sodium hydroxide	2,737	2,120	United States 1,587; Netherlands 387.
Stone:			
Dimension	24	253	Mainly from Guatemala.
Industrial	3,416	70	United States 29; Guatemala 20; Panama 20.
Sulfur	16	3,475	Mexico 3,455; West Germany 19.
Talc	67	54	United States 36; Italy 7; Norway 5.
Other nonmetallic minerals	258	443	United States 433; Norway 10.
Mineral fuels:			
Coal, all types	100	57	West Germany 42; United States 9.
Coke	209	207	All from West Germany.
Briquets	(1)	9	All from United States.
Mineral tars and products	349	1,022	United States 921; United Kindgom 73.
Natural gas liquids	1,509	911	Venezuela 867; Netherlands 43.
Petroleum:			
Crude and semirefined	53,735	374,043	Venezuela 361,112; Netherlands 11,340.
Refinery products:			
Gasoline	65,308	42,160	Netherlands 41,885; United States 216.
Kerosine	34,838	37,913	Netherlands 33,053; Venezuela 3,700; United States 1,119.
Fuel oil, all types	54,109	32,271	Netherlands 31,450; Venezuela 810.
Lubricants including greases..	4,127	5,020	Mainly from United States.
Paraffin, vaseline and waxes..	1,368	1,493	Mainly from United States.
Asphalt and coke	5,456	5,239	Venezuela 4,509; Netherlands 479.

[1] Less than ½ unit.

Source: Comercio Exterior, 1963.

COMMODITY REVIEW

Metals.—*Aluminum.*—The first aluminum extrusion plant in Central America began operations in El Salvador in 1959. The corporate name of the American-owned company is Aluminum Co. of Central America, S.A. (ALCOSA). Aluminum ingots used by the plant have been imported from the United States and Canada. The plant has produced extruded shapes up to 6 inches wide, including window shapes, decorative moldings, and electric conduits. In 1964, plans were announced to triple production with the possible inclusion of corrugated roofing. New equipment will include a 2,000-ton press which is expected to be in operation early in 1965.

Copper.—It is reported that Phelps Dodge de Centroamerica, S.A. began operating its 1,200 ton annual capacity copper-aluminum wire and cable plant early in the year. At the outset of operations, the plant, which has been granted duty-free import privileges and other tax advantages under the country's development law, will braid imported copper wire into cable, and insulate wire for electrical transmission. As the firm gains experience and market acceptance, it is proposed to install wire-drawing equipment, thereby changing its imports from wire to copper billets. The new plant will give employment to more than 150 workmen and will save El Salvador about $1.6 million in foreign exchange each year.

Gold and Silver.—No new developments were reported concerning the exploration survey at the dormant San Sebastián mine in 1963, nor has there been a reported decision by Canadian Javelin, Ltd., as to whether it would reopen the Monte Cristo mine which has been closed since 1960.

Iron and Steel.—The Japanese Metal Bulletin of May 7, 1964, announced that the Yodogawa Steel Co./C. Itoh group was planning to establish a galvanizing plant as a joint venture with El Salvadoran capital. Details of the project were not disclosed but it was understood that annual capacity was to be 10,000 tons of thin-gage galvanized sheet. There has been no later report as to whether the plans were consummated.

Nonmetals.—*Fertilizers.*—It was reported in April that El Salvador's first chemical fertilizer plant, a $5 million unit of FERTICA, S.A. (Fertilizantes de Centroamerica, S.A.) had gone on stream at Acajutla. The complex consists of three separate operations: A plant making sulfuric acid, one for the manufacture of superphosphates, and one for the production of complete fertilizers. Initial annual production was to be 16,500 tons of sulfuric acid, 20,000 tons of single superphosphate, and 58,000 tons of formulated fertilizers. Additional units were under construction for the production of 150 tons per day of nitric acid and 300 tons per day of ammonium nitrate. The latter sections were scheduled to go on stream late in 1965.

Mineral Fuels.—There were no developments reported in 1964 pertaining to oil or gas exploration, as prospects are considered poor. The $10 million refinery operated by RASA (Refineria Petrolera Acajutla, S.A.) in 1964 completed its first full year of operation with an output of products valued at $10,345,562. One of the most modern units in the world, the refinery can process 14,000 barrels per day of petroleum products ranging from kerosine and diesel fuel to gasoline and liquified petroleum gases. Consumption of petroleum products in the country during 1964 was 6,070 barrels per day, an increase of 16 percent over 1963, and was considerably below the refinery's productive capacity. As a result, El Salvador became a net exporter of petroleum products, with most of the export shipments going to countries in the immediate area.

SOURCE MATERIALS

The information contained in this chapter was taken from airgrams prepared by the U.S. Embassy at San Salvador, supplemented by "Anuario Estadístico" 1962 and 1963 (volume 1) of the Dirección General de Estadística y Censos, Ministerio de Economia, San Salvador, and from "Overseas Business Reports" published by the Bureau of International Commerce, U.S. Department of Commerce. The reference study "El Salvador" prepared by Industrial Development added considerably to background information; commodity information was supplied by Metal Bulletin, Chemical Week, World Petroleum, Petroleum Management, Bulletin of the American Association of Petroleum Geologists, and Japan Metal Bulletin.

GUATEMALA

According to the first preliminary estimates by the Bank of Guatemala, the nation enjoyed unsurpassed prosperity during 1964, and the real gross national product increased 7 percent to an estimated $1,246 million.[4] The contribution of the mineral industry to the country's agriculturally based economy was relatively unimportant. It has been estimated that the industry employed less than 0.5 percent of the economically active population, and that it accounted for less than 1 percent of the GNP. Cement continued to be the most valuable mineral product of the country, and the production of raw materials required for its manufacture constituted the major part of the mining activities. The refining of imported crude petroleum comprised the second most important mineral industry activity in Guatemala, and in its first full year of operation the refinery produced more than 1 million barrels of products valued at $3.8 million. Actuation of planned investment in new mineral industries was delayed as the year ended, with final action still pending by the Council of Ministers on the proposed mining code. After countless revisions, the outcome of efforts to insure the enactment of a viable code was still in doubt.

---

[4] Where necessary, values have been converted from Quetzals (Q) at the rate of Q1.00=US$1.00.

GOVERNMENT POLICIES AND PROGRAMS

Guatemala, as a member of the Central American Common Market (CACM) and a cosigner of the General Treaty of Central American Economic Integration, has recognized and adopted the principal of free enterprise as the basis for the democratic development of the national economy. The Government welcomes private enterprise and investment, both national and foreign, that will contribute to the economic development of the country. Guatemala and the other member states of the CACM contemplate complete economic integration among the countries by mid-1966. The Guatemalan Government has been active in promoting the economic development of the country largely through creating conditions conducive to local and foreign private investment. Expenditures for development work have been chiefly in the construction of roads, although electric power facilities have been established in areas previously insufficiently developed to be attractive to private investment.

A new mining code drafted by a United Nations expert was exhaustively studied and discussed throughout 1964, and although it was still under study by the Council of Ministers at yearend, the possibility of its adoption in 1965 was exceedingly favorable.

Geological data is available through the Department of Geology, General Administration of Minerals and Hydrocarbons, or through the Geological Section of General Administration of Cartography of Guatemala. Guatemala has the most advanced mapping program in Central America, and aerial photographs of the entire country are available. The General Administration of Cartography, with the help of the U.S. Army Map Service, has prepared topographic maps at a scale of 1: 250,000 for all of the country south of 15° N, and the fiscal 1964 program called for completion of four topographic sheets covering El Petén. In addition, more than half of the country has been mapped on a scale of 1: 50,000. At yearend the Government had under consideration a plan to use U.S. doctoral candidates for detailed geological surveys.

PRODUCTION

Complete data on the production of metals and minerals during 1964 were not available at yearend. The production of cement increased approximately 19 percent during the year, and the output of petroleum refinery products increased 74 percent as a result of full year operation of the refinery. The estimated value of cement and petroleum products was approximately $9 million, an increase of 32 percent of the output value for the same commodities in 1963.

TABLE 9.—Guatemala: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Atimony, content of concentrate [1]	108	64	29	28	----------
Cadmium, in zinc concentrate .... kilograms	[2] 56,011	[2] 42,731	[1] 12,400	[1] 7,100	----------
Chromite	181	100	20	----------	----------
Iron ore [e]	4,000	5,000	5,000	6,000	7,000
Lead:					
Content of concentrate for export	8,557	8,580	968	748	[1] 4
Local smelter production	181	56	62	47	NA
Silver .... troy ounces	[2] 663,121	[2] 515,905	370,595	64,173	[1] 9,445
Zinc, content of concentrate	10,042	7,926	816	1,169	[1] 3
Nonmetals:					
Cement .... thousand tons	112	125	117	157	186
Clays [3]	NA	10,650	10,267	15,292	41,044
Gypsum [3]	14,461	12,094	9,748	14,794	7,101
Limestone [e] .... thousand tons	560	[r] 673	[r] 583	[r] 702	1,071
Quartz [3]	NA	8,716	NA	11,001	21,936
Salt .... thousand tons	15	[r] 16	[r] 17	19	[e] 18
Mineral fuels:					
Petroleum refinery products:					
Motor gasoline .. thousand 42-gallon barrels	----------	----------	----------	217	447
Kerosine .... do	----------	----------	----------	36	76
Distillate fuel oil .... do	----------	----------	----------	116	251
Residual fuel oil .... do	----------	----------	----------	208	223
Liquefied petroleum gases .... do	----------	----------	----------	12	27
Total .... do	----------	----------	----------	589	1,024

[e] Estimate. [r] Revised. NA Not available.

[1] U.S. imports from Guatemala.

[2] Recoverable.

[3] Purchases by cement company. Other production not available.

TRADE

Detailed trade statistics have not been published by the Dirección General de Estadística (DGE) since 1961. However, preliminary unpublished data made available by the DGE indicate that both imports and exports increased in 1964. Imports on a c.i.f. basis rose 22 percent to $202.2 million, while exports on an f.o.b. basis advanced about 5 percent to $155.5 million. Discrepancies between certain of these official figures and figures obtained from other sources raise some question as to the accuracy of these preliminary official data.

Imports from the United States rose from $79.6 million in 1963 to $89.8 million in 1964, but the relative U.S. share of total imports dropped from 48.1 to 44.5 percent. West Germany and El Salvador followed the United States with shares of 10.9 and 9.5 percent, respectively.

According to the figures of DGE, petroleum products, traditionally Guatemala's principal import, fell to second place in relative importance in 1964. However, there is some reason to believe that the DGE data did not include refinery imports of reconstituted crude oil which amounted to more than $3 million in 1964. A 54-percent increase was noted in the import value of iron and steel ingots, plates, bars, and structural shapes compared with those of 1963.

United States purchases of Guatemalan exports in 1964 dropped to $53 million, or 34 percent of the total. A sharp rise in exports to Central America and the increasing importance of cotton (mostly sold to Japan and European countries) accounted in large part for the relative decline of exports to the United States. Shipments of lead and zinc, which had slowed to a trickle in 1962 and in the first half of 1963, came to almost a complete stop during the last 6 months of 1963; there were no exports of zinc during 1964, and only a minute quantity of lead was shipped.

TABLE 10.—Guatemala: Selected metal and mineral imports

Commodity	Value, c.i.f. (thousand dollars)		Quantity (thousand metric tons)	
	1963	1964	1963	1964
Iron and steel:				
Ingots, plates, bars and structurals	2,410	3,704	21.5	28.3
Pipes and tubes	1,459	1,820	6.9	6.6
Fertilizers	2,786	4,128	32.4	40.9
Petroleum products except asphalt	13,482	[1] 15,343	518.6	647.2

[1] Apparently does not include refinery imports of reconstituted crude oil valued at more than $3 million.

TABLE 11.—Guatemala: Imports of petroleum products
(Thousand metric tons)

Product	1963	1964	Principal sources, 1964
Crude oil and bunkers	160.4	191.8	Venezuela 161; Netherlands Antilles 27.
Gasoline, all types	98.6	91.3	Netherlands Antilles 47; El Salvador 34.
Kerosine and jet fuel	50.7	45.1	Netherlands Antilles 31; El Salvador 10.
Distillate fuel oils	183.5	275.4	El Salvador 154; Netherlands Antilles 43.
Lubricants, including greases	9.5	10.0	United States 9.
Propane and butane	5.6	6.0	Venezuela 4; Panama 1.
Tar and asphalt	4.3	20.1	Venezuela 13; El Salvador 6.
Other	6.0	7.5	Mainly from United States.
Total	518.6	647.2	

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Aceros Suarez, which in 1963 embarked on a $500,000 rolling-mill venture, announced that its total investment would be increased to $1.5 million and would include facilities for the production of iron and steel from local scrap. During 1964 the company produced rod and small shapes from imported raw materials. It has been reported that the U.S. firm, Ramseyer and Miller, Inc. will provide technical assistance.

Nickel.—Development of the extensive lateritic deposits on both sides of Lake Izabal by Exploraciones y Explotaciones Mineras Izabal, S.A. (EXMIBAL) was again deferred as the company awaited adoption of the new Guatemalan mining code. The deposits, similar to the Cuban deposits in that they are residual surface layers suitable for strip mining, were found by Hanna Mining Co. while looking for iron ore. Although the iron content was not high enough to warrant development, the 1.5 percent nickel content was quite favorable. The International Nickel Co. of Canada, Ltd., and the Hanna interests formed EXMIBAL, and the latter company obtained exploration licenses on areas on the north and south shores of Lake Izabal. When initial exploration and laboratory tests proved successful, the company filed for mining concessions in June 1962. Since then all the prerequisites have been completed, and an investment of no less than

$60 million is envisaged. EXMIBAL has applied for a $40 million loan from the World Bank for the project, and the company will invest $20 million of its own money. The $60 million total includes $2 million already spent for exploration and testing, working capital, preproduction expenses including construction, machinery, and equipment, interest, and allowances for contingencies. Exploration of the deposits disclosed 25 to 30 million tons of lateritic nickel ore, and the first stage, pyrometallurgical processing plant planned will have an initial capacity of 25 million pounds of a nickel-iron product annually; further processing will be done outside Guatemala. When in operation, the mining and processing operations will employ some 600 workers and have an annual payroll of $1.5 million.

Nonmetals.—Statistics covering the complete production of nonmetallics are not available, and except for limestone, those reported in the production table represent purchases or production by Cementos Novella, S.A., the only operating cement company in Guatemala. The Guatemalan Directorate General of Mines and Hydrocarbons has estimated that the production of limestone by Cementos Novella, S.A., is about one-third of the national production of this commodity. This estimate is reflected in table 9.

Mineral Fuels.—*Petroleum.*—No exploration has been done in the Petén (northeastern Guatemala) since late 1962. Seven unsuccessful wildcat wells were drilled in the Petén area during the period 1958 to 1962, but all companies have now renounced any acreage held in the Petén.

Exploration interest in Guatemala in 1964 shifted from the Petén area to the Pacific Coast where Esso Standard (Guatemala) Inc., applied for a permit on 397,303 hectares offshore. Señor René Abularach, a Guatemalan independent, filed an application for a coastal concession covering 399,640 hectares. It was reported that eight other companies or individuals (unidentified) had filed applications on the Pacific coastal plains and offshore areas. At yearend, none of these latter applications for exploration acreage had been granted. Sr. Abularach, however, began drilling a stratigraphic test on his application area. Abularach's San José-1, located approximately 3 kilometers north of the Pacific port of San José, was spudded in on December 9, 1964, with a cable-tool rig, and was drilling at a depth of 320 feet by yearend. This is the first stratigraphic test well to be drilled in the Pacific coastal plains area of Guatemala.

Texaco, Inc., was building an 8,500-barrel-per-day refinery at Escuintla, and a 40-kilometer pipeline from the Pacific coast port of San José for the transport of crude supplies to the refinery site. This plant will be the country's second refinery, and construction was nearing completion at yearend. Formal inauguration of the plant was set for some time in early 1965.

Guatemala's initial refinery, Refineria Petrolera de Guatemala-California, Inc. (GUATCAL) awarded a contract to the Lummus Co. for construction to triple the plant capacity to 12,000 barrels of crude oil per day. A new crude oil distillation unit and catalytic reformer will be built to complement existing equipment. Completion of this expansion, which is expected to cost $3 million, was scheduled for mid-1965. The expansion will not only provide for domestic consumption but will also make available products for export via a pipeline which will run parallel to the present crude oil line between the refinery and the Puerto Matiás de Gálvez wharf. GUATCAL is owned 60 percent by Standard Oil Co. of California, and 40 percent by Royal Dutch Petroleum Co. (Shell).

SOURCE MATERIALS

The information contained in this chapter was supplied mainly by the U.S. Embassy, Guatemala City, Guatemala, through the U.S. Department of State, and supplemented by International Commerce, published by the U.S. Department of Commerce. Additional information was obtained from the periodicals Industrial Development, Petroleum Management, World Petroleum Magazine, and the Bulletin of the American Association of Petroleum Geologists.

HONDURAS

The volume and value of most metals and minerals produced in Honduras increased slightly in 1964. Output of lead and zinc in concentrates declined in quantity but may have increased slightly in value. The contribution of the mining industry to the gross national product (GNP) of $468 million[5] in 1964 is estimated at about 2.4 percent. Estimated employment in the mining industry was less than 2,000 persons. During 1964 there were three metal mining companies operating but only one produced on a large scale. Also in 1964, a fourth company established its Central American headquarters in Tegucigalpa as preliminary studies encouraged it to continue its search for nonferrous ore deposits.

GOVERNMENT POLICIES AND PROGRAMS

It has been the policy of the Government of Honduras to encourage industrial development by private enterprise by providing incentives to new and expanding industries by means of concessions in taxes and import duties. The industrial encouragement law of Honduras in effect at yearend will be superseded, however, by the Central American Common Market (CACM) industrial encouragement law at such time as the five countries have ratified and deposited their instruments of ratification. The new law will cover most industries except service industries, mining and forestry operations.

The major barrier to expansion of the mineral industry has been the inaccessibility of deposits. The Government at yearend was carrying on an active roadbuilding program including a number of feeder road projects that should enhance the possibility of uncovering new deposits. The Government has created an industrial development division in the National Development Bank (Banco Nacional de Fomento). The development office prepares feasibility studies for new industries, gives technical assistance, and promotes industrial opportunities.

---

[5] Where necessary, values have been converted from Lempiras (L) at the rate of L1.00=US$0.50.

On January 1, 1964, a 5 percent export tax became effective on the declared value of silver in concentrates. This tax was reduced to 2½ percent in November.

PRODUCTION

The reported value of mineral production in 1964 increased about 30 percent over the incomplete value reported for 1963 largely as a result of the inclusion of data on limestone, output valued at $2.75 million, for the first time. Significant increases in the production of cadmium, cement, and salt were also important factors in raising the value of mineral production to approximately $11 million.

TABLE 12.—Honduras: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Cadmium, content of concentrate	4.5	4.6	[r] 14.0	[e] [r] 87.0	[e] 104.6
Copper, content of ore	1	-----	-----	-----	-----
Gold troy ounces	2,731	2,274	2,811	3,070	3,401
Lead, content of concentrate	5,364	6,134	5,917	[e] 8,300	[r] 7,484
Silver thousand troy ounces	2,948	3,545	3,180	[e] 3,164	3,220
Zinc, content of concentrate	4,486	[r] 6,644	6,584	[1] 9,900	8,568
Nonmetals:					
Cement	34,322	41,890	55,913	60,480	72,843
Lime, calcined	10,796	10,433	NA	NA	NA
Limestone	NA	NA	NA	NA	118,114
Salt [1]	2,881	984	1,906	3,190	5,909

[1] Exports. [e] Estimate. [r] Revised. NA Not available.

TRADE

Although exports and imports in 1964 increased to $95 million and $102 million, respectively, the detailed commodity breakdown will not be available until late 1965. The latest available details of trade are for 1963. During that year, total exports were valued at $82 million of which 8.2 percent or $6.75 million was furnished by minerals and metals. Silver was by far the most important mineral export, and was valued at $3.5 million and comprised 51.6 percent of all mineral exports and 4.3 percent of total exports. Concentrates of zinc and lead also were important mineral exports valued at approximately $2.6 million. The United States was the destination for approximately 58.6 percent of total Honduran exports and approximately 99 percent of all mineral exports. The remaining 1 percent was scattered among neighboring countries belonging to the CACM.

Total imports in 1963 were valued at $95 million, with mineral commodities accounting for 13.3 percent. Crude petroleum and petroleum products valued at $7.2 million accounted for 7.6 percent of the imports, while metals and minerals valued at $5.45 million made up the remaining 5.7 percent. Iron and steel semimanufactures were the principal metal imports and accounted for about 50 percent of the nonfuel imports. Aluminum, copper, and lead also were important metallic imports. Distillate fuel oils, motor gasoline, and lubricants were the most important petroleum imports on a value basis, while crude and partially refined petroleum was the second most important petroleum import by weight. The United States was the source of $45.4 million or 47.8 percent of the total imports into Honduras. The majority of the mineral and metal imports originated in the United States; the principal exceptions to this being fertilizer materials for which West Germany was the principal source, and petroleum products for which the Netherlands Antilles was the principal source. On the basis of overall imports, Japan was the second largest supplier to Honduras with 9.1 percent of the total imports followed by El Salvador with a share of 8.3 percent of total imports.

TABLE 13.—Honduras: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Gold troy ounces	2,803	3,044	All to United States.
Iron and steel, scrap	74	329	Mainly to El Salvador.
Lead, ore and concentrate	8,573	9,900	All to United States.
Silver, all forms thousand troy ounces	2,906	4,856	Do.
Zinc, ore and concentrate	9,785	10,730	Mainly to United States.
Other:			
Nonferrous ores and concentrates	130	1,660	All to United States.
Nonferrous scrap	11	42	Japan 20; United States 10; El Salvador 9
Nonmetals:			
Cement:			
Asbestos	(1)	110	All to El Salvador.
Portland	22,816	22,767	El Salvador 18,369; British Honduras 3,570
Fertilizer all types	17	14	Mainly to El Salvador.
Lime	17	21	All to Nicaragua.
Salt	1,736	3,190	El Salvador 2,818; Nicaragua 371.
Stone:			
Dimension	14	9	Costa Rica 7; El Salvador 2.
Industrial, type not specified	--------	137	Nicaragua 134; El Salvador 3.
Other nonmetallic minerals	18	18	All to El Salvador.

[1] Less than ½ unit.

TABLE 14.—Honduras: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys, all forms	109	152	United States 120; Japan 21.
Copper and alloys:			
Metal, all forms	47	51	Mainly from United States.
Sulfate	45	35	Do.
Iron and steel:			
Pig iron	16	5	All from United States.
Scrap	3	3	Mainly from El Salvador.
Ingots and equivalent forms	823	965	United States 719; Japan 216.
Semimanufactures	14,630	12,957	United States 4,269; Belgium 2,729.
Lead and alloys, all forms	25	24	United States 12; Mexico 5.
Silver and alloys troy ounces all forms.	245,497	900	All from United States.
Tin and alloys, all forms long tons	6	5	Mainly from United States.
Zinc and alloys, all forms	252	99	United States 54; West Germany 20.
Other:			
Nonferrous minerals	1	1	All from United Kingdom.
Nonferrous metals	2	2	All from United States.

See footnote at end of table.

TABLE 14.—Honduras: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals:			
Abrasives:			
Corundum and emery	58	(1)	Mainly from United States.
Diamond, industrial carats	405,000	195,000	All from United States.
Asbestos	8	186	Mainly from Canada.
Cement:			
Asbestos	2,388	1,059	El Salvador 916; United Kingdom 100.
Portland	4,265	5,361	Mainly from United States.
Clay and clay products:			
Kaolin	18	6	All from United States.
Refractory and common	17	4	Guatemala 2; United States 1.
Nonrefractory brick	134	54	Mainly from El Salvador.
Refractory brick	147	482	Mainly from United States.
Diatomaceous earth	96	77	All from United States.
Fertilizers:			
Nitrogenous	12,125	12,619	West Germany 7,631; Netherlands 4,269.
Phosphatic	589	47	United States 37; West Germany 7.
Potassic	1,849	1,738	Mainly from United States.
Mixed	769	1,017	United States 763; El Salvador 155.
Graphite	2	3	United States 1; France 1.
Gypsum:			
Crude	2	....	
Calcined	11	17	All from United States.
Lime, all types	175	273	United States 180; El Salvador 93.
Marble	5	17	Mainly from Italy.
Quartz	8	11	All from United States.
Salt, all forms	1,906	1,784	El Salvador 1,501; United States 175.
Sodium carbonate	23	20	United States 13; United Kingdom 5.
Sodium hydroxide	633	878	United Kingdom 444; United States 432.
Stone:			
Industrial, type not specified	1	313	Mainly from Guatemala.
Sand, gravel, crushed rock	4	2	Mainly from France.
Sulfur, all forms	5	46	Mainly from United States.
Talc, natural or ground	16	25	Italy 21; United States 4.
Mineral fuels:			
Coal	184	95	All from United States.
Coke	5	3	All from West Germany.
Mineral tars and products	196	74	Mainly from United States.
Natural gas liquids	988	1,215	Mainly from Venezuela.
Petroleum:			
Crude and partially refined	86,512	68,275	Netherlands Antilles 39,647; Venezuela 18,933; Colombia 4,877.
Refinery products:			
Gasoline	44,287	44,712	Netherlands Antilles 34,985; United States 5,558; Trinidad 4,169.
Kerosine	12,586	13,611	Netherlands Antilles 10,468; United States 1,593; Trinidad 1,415.
Distillate fuel oil	74,052	94,126	Netherlands Antilles 80,875; Trinidad 6,006; Venezuela 4,015.
Lubricants including greases	4,970	4,465	Mainly from United States.
Paraffin, vaseline, and waxes	543	761	Do.
Asphalt and coke	2,839	449	Netherlands Antilles 338; United States 110.

[1] Less than ½ unit.

COMMODITY REVIEW

Metals.—The New York and Honduras Rosario Mining Co. was the major producer of lead and zinc concentrates and gold and silver bullion during 1964. The Companía Minera Los Angeles, S.A., also produced lead and zinc concentrates containing silver and cadmium. The American Smelting and Refining Company established a regional geologic office for Central America early in the year. A U.S. mining firm was reported to have contracted Honduran interests to prospect for large low-grade mineral deposits. Other U.S. interests that for some time had been exploring an old gold and silver mine south of Tegucigalpa made a decision to go into production, and equipment was brought in.

Iron and Steel.—A new company, Aceros Industriales, S.A., was formed in San Pedro Sula, and construction of a rolling mill was begun. The company planned to use imported billets for the production of commerical shapes up to 2 inches, including angles, T's and reinforcing bars.

Silver.—A major expansion program for the El Mochito mine of the New York and Honduras Rosario Mining Co. was begun in 1964. Phase one of the mine and mill expansion was completed in December with the installation of a new skip hoisting system and the installation of a fourth ball mill in the concentrator. As a result, milling capacity was increased by 100 tons to 500 tons per day. Phase two of the expansion program covers major mine equipment additions and is scheduled for completion in mid-1965. Capital equipment additions that will constitute the third phase will increase mill capacity to 750 tons per day and are scheduled for completion in the third quarter of 1966. The production of the mine and mill was reduced during the first quarter of 1964 due to a shortage of electric power. Hydroelectric power was obtained from the new government-owned hydroplant at Cañaveral which began operations in April. The diesel electric plant at Mochito was placed on a standby basis for use in case of emergency.

Exports of silver during 1964 were reported to be down slightly, probably a result of the 5 percent export sales tax on silver and concentrates which went into effect on January 1, 1964. This export tax was reduced to 2.5 percent early in November.

Nonmetals.—*Cement.*—Cementos de Honduras, located near San Pedro Sula, and the only cement plant in the country, put in operation a second kiln and added other necessary equipment, thereby doubling its capacity from 150 tons to 300 tons of cement per day.

Mineral Fuels.—*Petroleum.*—No oil exploration activity of any type was reported for Honduras during 1964. The Pure Oil Co. discontinued its drilling program in Honduras after abandoning its Mosquitia One wildcat in December 1963 at a depth of 13,898 feet. To conform with the terms of the 1963 petroleum code, all concessionaires must modify their concessions by the end of 1966. Known changes in concession status during 1964 include a partial relinquishment by The Pure Oil Co. of Honduras in the Mosquitia area, Department of Gracias a Díos. In June the company surrendered 305,276 hectares onshore and 724,370 hectares offshore, thereby reducing its holdings in Honduras to 3,051,280 hectares.

Petroleum products are imported into Honduras and marketed by Esso Standard Oil, S.A., Ltd., Texaco Caribbean, Inc., Shell Caribbean Petroleum Co., and Companía Petrolera California, S.A. Consumption in 1964 was estimated at 4,200 barrels per day, or about the same as in 1963.

SOURCE MATERIALS

The primary source of information contained in this chapter was obtained from the U.S. Embassy, Tegucigalpa, Honduras, through the U.S. Department of State. Trade tables were extracted from Comercio Exterior de Honduras, 1962 and 1963. Information pertaining to petroleum activities was obtained from World Petroleum Report, the Bulletin of the American Association of Petroleum Geologists, and Petroleum Management magazine. Additional details were obtained from Overseas Business Reports of the U.S. Department of Commerce.

NICARAGUA

For the fourth consecutive year, Nicaragua experienced great economic expansion. The Nicaraguan economy is predominantly agricultural and greatly dependent upon earnings from crop exports, particularly cotton, but increased production of other basic agricultural commodities, good prices for exports, and rising industrial production also played important roles in pushing the gross domestic product (GDP) to $481.8 million,[6] an increase of about 8 percent above 1963. The minerals industry increased its importance to the nation's economy by supplying products valued at $26 million. The three metallic minerals produced, copper, gold, and silver, accounted for about 10 percent of Nicaragua's foreign exchange earnings, while the nonmetallic mineral production was consumed domestically. Approximately 1 percent of the economically active population was engaged in the mineral industry. An improved copper price, as well as increased production of all metals and nonmetals except lime, plus the first complete year of petroleum refinery output all contributed to a record year for the mineral industry.

GOVERNMENT POLICIES AND PROGRAMS

The Government of Nicaragua retained ownership and operational control of the Nation's postal, telephone, and telegraph facilities, and the bulk of its railroad system. Otherwise, its participation in the industrial sectors of the economy was negligible. The Government has tried to follow recommendations made by the World Bank developed from a study in 1952 of the Nation's economy and its potential for development. One outcome of this has been the establishment of the Industrial Development Institute (INFONAC), an autonomous agency of the Government that seeks to sponsor projects utilizing Nicaraguan natural resources, producing goods which would otherwise have to be purchased with foreign exchange, and improving industries already operating in Nicaragua. It may make direct investments and extend loans in accordance with plans which it must prepare annually. The Law for the Protection and Encouragement of Industrial Development provides that industries are to be classified as basic, necessary, or convenient. Customs and other benefits are granted according to classification. In the case of foreign firms, participation by local capital is encouraged but is not necessary to qualify for benefits under the law. Mineral exploration and development in 1964, as in prior years, was hampered by a restrictive mining law. Corrective legislation drafted in 1963 was still under consideration by the Nicaraguan Congress at yearend, but passage of a new law in early 1965 was anticipated. All of Nicaragua's mining companies were privately owned, and all of the metal mines and the petroleum refining industry were foreign-owned. The Government continued efforts to create conditions favorable to stimulation of mineral exploration and development. A geological survey of the northeastern part of the country was being made with the technical assistance of the United Nations. The survey of the 20,000 square kilometer area will not be completed until 1966, at which time the results will be published. Until that time, the Government will not grant any new mineral concessions in the survey area.

---

[6] Where necessary, values have been converted from cordobas (C$) at the rate of C$7=US$1.00.

PRODUCTION

Production of copper increased 25 percent, and gold 10 percent in 1964. Silver production also increased but not to the extent apparent in the production table. The 1964 silver production figure includes silver contained in copper concentrates, a figure not available for previous years. The nonmetal industry also showed solid improvement except in the case of lime, output of which was slightly higher than the 1962 level but below the estimated 1963 figure. An important factor in the increased value of mineral production was the contribution of the petroleum refinery in its first full year of operation. The output in 1964 was valued at $6.6 million as compared with the value of partial-year production of $4.6 million in 1963.

TABLE 15.—Nicaragua: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Copper concentrate, metal content	4,897	6,277	7,272	[e] 7,283	9,240
Gold ... troy ounces	210,200	226,251	221,984	204,769	[r] 225,581
Silver ... do	326,673	417,253	500,050	405,252	[e] [r] 515,000
Nonmetals:					
Cement	32,297	39,019	45,906	53,812	61,052
Diatomaceous earth	2,040	[e] 2,722	1,283	[e] 1,600	----------
Gypsum	NA	NA	3,250	2,500	5,500
Lime	24,823	25,460	26,013	[e] 28,400	26,392
Salt, marine	11,499	[e] 12,474	9,467	16,495	17,319
Mineral fuels: Petroleum refinery products:					
Motor gasoline ... thousand 42-gallon barrels	----------	----------	----------	399	606
Kerosine and jet fuel ... do	----------	----------	----------	116	163
Distillate fuel oil ... do	----------	----------	----------	240	404
Residual fuel oil ... do	----------	----------	----------	371	583
Liquefied petroleum gas ... do	----------	----------	----------	11	18
Total ... do	----------	----------	----------	1,137	1,774

[e] Estimate. [r] Revised. NA Not available.

TRADE

Foreign trade remained a very important aspect of the Nicaraguan economy. Export sales have regularly accounted for up to one-fourth of the total GDP. Exports during 1964 were at the highest level in Nicaragua's history, enabling the country to increase both its imports and its international reserves. Total exports were estimated at $148.7 million, up from $106.8 million in 1963. Total imports also increased from $110.8 million in 1963 to $155.9 million in 1964. Nicaragua's principal trading partner was the United States which in 1963 shipped Nicaragua $53.7 million worth of goods and purchased from it $42.1 million worth of crops and other commodities. The U.S. share of the

Nicaraguan market has fallen from 81 percent in 1950 to 48.5 percent in 1963. Japan and West Germany are the second and third principal suppliers of Nicaraguan requirements. Increased sales of iron and steel manufactures and semimanufactures and machinery has accounted for the rise in West Germany's contribution, while Japan has found increasing acceptance of its low-cost consumer goods. Mineral exports go mainly to Canada, Japan, and the United States. Although the Nicaraguan trade publication indicates that the United States is the recipient of Nicaraguan copper exports, this material has gone entirely to Japan since 1961. Venezuela and Netherlands Antilles contributed the major portion of petroleum and petroleum products to the Nicaraguan market.

TABLE 16.—Nicaragua: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Copper, cement	10, 025	12, 748	All to United States.[1]
Gold, bars and ingots....troy ounces	221, 326	203, 386	Canada 115,003; United States 88,383.
Iron and steel:			
Ingots and semimanufactures	----------	284	Costa Rica 266; El Salvador 18.
Scrap	40	46	Japan 24; United States 13; Spain 9.
Silver, bars and ingots...troy ounces	288, 135	203, 514	United States 162,361; Canada 41,153.
Zinc, all forms	74	328	Costa Rica 155; El Salvador 132; Honduras 41.
Nonmetals:			
Lime	4	9	All to Costa Rica.
Salt	74	211	Honduras 118; El Salvador 89.

[1] Reported in official source. Ultimate destination was Japan.

Source: Memoria de la Recaudacion General de Aduanas, 1962, 1963. Managua.

TABLE 17.—Nicaragua: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys: Semimanufactures.	238	275	United States 102; El Salvador 58, United Kingdom 25.
Copper and alloys:			
Sulfate	12	15	United States 10; Netherlands 5.
Metal, semimanufactures	81	73	United States 32; Mexico 27; United Kingdom 6.
Iron and steel:			
Scrap	15, 226	13, 356	All from United States.
Pig iron	1, 053	10	All from West Germany.
Ingots and equivalent primary forms.	50	1, 502	West Germany 1,082; Belgium 397; United Kingdom 17.
Semimanufactures	24, 762	18, 578	Belgium 5,918; Japan 4,945; United States 3,083.
Lead and alloys:			
Unwrought	35	55	Mexico 38; Netherlands 8; United States 6.
Semimanufactures	57	8	Mainly from United States.
Silver and alloys, all forms..troy ounces	2, 058	6, 912	United States 4,790; Netherlands 2,029.
Tin and alloys:			
Unwrought...long tons	14	17	United Kingdom 16; United States 1.
Semimanufactures...do	4	3	United Kingdom 2; United States 1.
Zinc and alloys:			
Unwrought	242	619	West Germany 300; Belgium 218; Netherlands 100.
Semimanufactures	35	66	United States 61; Guatemala 3.
Other nonferrous minerals, metals and scrap.	2	3	All from United States.

TABLE 17.—Nicaragua: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals:			
Abrasives, natural	1	1	United States 0.5; West Germany 0.5.
Asbestos	56	33	United States 25; United Kingdom 4; West Germany 3.
Cement:			
Asbestos	293	1,768	Belgium 995; El Salvador 381; Honduras 144.
Portland	1,559	3,628	West Germany 1,597; United States 918; Honduras 404.
Clay and clay products:			
Common and refractory	212	202	United States 189; Costa Rica 5; United Kingdom 5.
Common clay brick	16	34	All from Costa Rica.
Refractory clay brick	347	294	United States 199; Costa Rica 72; West Germany 14.
Feldspar, fluorspar and cryolite	--------	4	All from United States.
Fertilizers:			
Nitrogenous	11,966	12,361	Belgium 4,268; Italy 2,438; West Germany 1,888.
Phosphatic	725	1,968	Netherlands 1,349; United States 616.
Potassic	451	366	United States 320; Belgium 46.
Mixed	8,779	7,191	United States 5,643; Italy 1,543.
Graphite	11	2	United Kingdom 1; West Germany 1.
Lime, all types	483	974	Guatemala 546; United States 414.
Mica	1	2	All from United States.
Salt	691	589	El Salvador 217; United States 216; Honduras 131.
Sand, gravel and crushed rock	7	5	United States 4; Guatemala 1.
Sodium carbonate	227	220	United States 151; United Kingdom 40; West Germany 25.
Sodium hydroxide	1,481	1,336	United Kingdom 635; United States 591; West Germany 110.
Stone:			
Dimension	68	239	Guatemala 105; Italy 65; El Salvador 36.
Industrial	13	20	West Germany 10; Italy 8.
Sulfur	8,353	6,832	United States 6,810; West Germany 22.
Mineral fuels:			
Coal	12	14	All from United States.
Coke	50	71	West Germany 54; Belgium 10; United States 6.
Mineral tars and products	135	730	United States 563; Venezuela 96; Netherlands Antilles 68.
Natural gas liquids	799	277	Costa Rica 248; United States 29.
Petroleum:			
Crude and partially refined thousand 42-gallon barrels	128	1,003	Mainly from Venezuela.
Refinery products:			
Gasoline do	561	356	Netherlands Antilles 338; United States 18.
Kerosine do	143	137	Netherlands Antilles 128; United States 9.
Fuel oil, all types do	763	460	Netherlands Antilles 267; Venezuela 170; United States 16.
Lubricants including greases	4,175	4,017	United States 3,998; Costa Rica 15.
Paraffin, vaseline, and waxes	866	930	United States 920; West Germany 10.
Asphalt and coke	2,203	2,957	Venezuela 2,576; United States 206; Costa Rica 175.

Source: Memoria de la Recaudacion General de Aduanas, 1962, 1963. Managua.

COMMODITY REVIEW

Metals.—*Copper.*—The Canadian-owned Rosita Mines, Ltd., at Siuna was the only producer of copper minerals during 1964. Production of 9,240 tons of copper in concentrates marked a new high for the company, due primarily to the conversion in February from the treatment of copper oxide ore to sulfide ore. In previous years, the company had leached copper oxide minerals and recovered copper precipitates from the leach solution with scrap iron. Conversion to the straight sulfide flotation process has resulted in reduced operating costs and increased recovery of copper with contained gold and silver. Reserves as of September 30, the company's fiscal year, were 1,380,000 tons of proven ore averaging 3.81 percent copper and 0.082 ounces of gold and 62,000 tons of possible ore averaging 3.81 percent copper and 0.018 ounces of gold.

Gold and Silver.—Three gold mining companies continued operation during the year. The Neptune Gold Mining Co., owned by American Smelting and Refining and New York & Honduras Rosario Mining Co., was the largest producer. Mines controlled by the company produced 281,800 metric tons of ore from which 79,333 ounces of gold and 99,900 ounces of silver were recovered. New ore developed during the year was approximately equal to the tonnage mined. La Luz Mines, Ltd., 63.3 percent owned by Falconbridge Nickel Mines, Ltd., of Canada, produced 66,000 ounces of gold from 628,772 tons of ore. Ore reserves at La Luz as of September 30, 1964, were 3,167,500 tons of positive ore averaging 0.106 ounces of gold and 1,646,500 tons of possible ore averaging 0.093 ounces of gold. The Empresa Minera de El Setentrion, controlled by Noranda Mines, Ltd., milled an average of 337 tons per day, averaging 0.48 ounces of gold per ton, and recovered 55,319 ounces, an increase of 3,700 ounces from 1963. Surface drilling at the property has indicated some values in a vein system previously considered barren. Ore reserves at yearend were set at 164,172 tons containing 0.42 ounces of gold as compared with reserves at the beginning of 1964 which were 158,212 tons containing 0.49 ounces of gold.

A large portion of the silver produced in Nicaragua is associated with gold, and is recovered in gold-silver bullion. Silver is also recovered with the copper concentrates at Rosita, and in 1964 an estimated 183,000 ounces were so recovered.

Nonmetals.—*Cement.*—The Compañía Nacional Productora de Cemento, founded in 1940, continued to be the only cement-producing company in Nicaragua. The record output of 61,000 tons during the year was not sufficient to meet domestic demand.

Fertilizers.—Occidental Petroleum Co., Los Angeles, Calif., through its subsidiary Interore International, S.A., formed Interore de Centroamerica, S.A., which is 50 percent owned by local farmers. At yearend the company was installing a compounding and mixing plant for imported fertilizer components at Corinto, 145 kilometers from Managua. It was anticipated that the first stage of the plant would be in operation by March 1965, with initial production capacity of 70,000 tons per year of mixed fertilizer. The overall venture will entail an investment of $5 million.

The Ministry of Economy also approved applications for two other fertilizer factories. One of these, Abonos Superiores, was under construction at Corinto, and represented a joint investment, between the Tennessee Corp. and Nicaraguan capital, of about $700,000.

Diatomaceous Earth.—Deposits which produced diatomite in previous years were flooded by the creation of an artificial lake to obtain hydroelectric power on the Tuma River.

Mineral Fuels.—The major new development in the petroleum field during the year was the application by Esso Standard Oil for permission to explore for petroleum on the Continental Shelf off Nicaragua's Pacific coast. According to available information, the Amjon Exploration Co. of California, the sole concessionaire in the country in 1964, did not initiate exploration on any of its 3 blocks, which totaled some 300,000 hectares, and which had been acquired in 1963.

There was no reported government action on Pure Oil's applications during 1963 for exploration concessions on 700,000 hectares located in the northeasternmost part of the country and extending offshore.

In 1963 a geochemical survey sponsored by the Nicaraguan Government was carried out by a graduate student from the University of California. Results released in 1964 indicated that the above work consisted of gathering and analysing for fluorescence more than 2,000 samples from the Pacific coast area between Latitude 11°40′ N. and 12° N. Anomalies were discovered, some of which seem to correspond with known structures.

Esso Standard Oil, S.A., completed its first full year of refinery operation at its 5,600-barrel-per-day Managua plant. Consumption for Nicaragua was reported at 6,600 barrels per day in 1964, as compared with 4,400 barrels per day in 1963. All crude oil treated at the refinery was imported from Venezuela. The refinery supplies Nicaragua with virtually all of the refined petroleum products consumed in the country, the major exceptions being lubricants, asphalts, aviation gasoline, and waxes. The $8 million refinery was built under a revolutionary principle whereby the refinery process is continuous. Instead of going into tanks for storage between stages, the petroleum goes from crude oil to final product in one continuous operation, permitting savings in tankage and other equipment that amount to 40 percent of the investment.

SOURCE MATERIALS

The information contained in this chapter was obtained from airgrams from the U.S. Embassy, Managua, Nicaragua; from Memoria de la Recaudacion General de Aduanas por 1962 and 1963; from various Overseas Business Reports published by the Bureau of International Commerce, U.S. Department of Commerce; from Annual Reports of mining companies and from Nitrogen Magazine, World Petroleum Report, Bulletin of the American Association of Petroleum Geologists, Petroleum Management, and Nicaragua—a reference study by Conway Research, Inc.

PANAMA

There were no important developments in the minerals industry of Panama during 1964. The three major commodities produced from native minerals were portland cement, clay products, and salt. All of these products were produced in sufficient quantity to meet domestic needs, but were exported only on a very small scale, if at all. Output of clay products was reported to have increased approximately 25 percent over 1963, and salt production reached a new record high, while production of cement dropped slightly. Panamanian authorities reported a small increase in clandestine gold-panning activities but actual production was believed to be small. Three processing plants treating imported raw materials continued operations during 1964. Of these, Refineria Panama, S.A., a petroleum refinery which started operations in mid-1962, was the largest single industrial establishment in the country. The refinery output was considerably in excess of Panamanian requirements, and refined petroleum products vied with bananas as Panama's most important export by value, with shipments in 1964 of $34.2 million.[7] Panama's only steel rolling mill produced a sufficient supply of steel reinforcing rods from imported billets to completely meet local demands while the only aluminum extrusion plant in the country completed its first full year of operation with an output of finished products valued at approximately $1.6 million. The total value of domestic production of minerals and mineral products was difficult, if not impossible, to obtain, since in most local industries there was only one major producing company and these companies were reluctant to make known precise information.

GOVERNMENT POLICIES AND PROGRAMS

Although agriculture has remained the most important sector of the economy, construction, power, commerce, and services in the last 10 years have grown more rapidly than the gross national product as a whole. Mining as such has been of relatively small importance to the nation's economy, and although there are a number of known mineral deposits, many of these are either of low grade or of undetermined value. To encourage development of its potential mineral resources, the Panamanian Government in 1963 adopted Decree Law No. 23 which embodied a new and comprehensive code of mineral resources. This code became effective on July 13, 1964, and considerably liberalized the terms under which exploration and exploitation concessions could be granted and extended. Included in the code is a guarantee that anyone making a commercially exploitable discovery under an exploration concession would have the right to obtain an exclusive exploitation concession under the same terms that were in effect at the time the exploration concession was granted.

The Government of Panama has encouraged industrial development by providing incentives to new and expanding industries in the form of concessions in taxes and import duties. Companies engaged in the production of minerals or mineral products have been able to obtain protection in the form of tariffs and import restrictions upon demonstration of an ability to supply the market with an acceptable domestically produced product at a reasonable price. The economic philosophy of Panama remained that of a free enterprise democracy. The state continued guarantees of the right of property subject to expropriation in the public interest pursuant to judicial judgment and prior compensation. The Government has followed a policy of encouraging private development of production and has been active in providing the communications, health facilities, and other infrastructure necessary to economic development. Except in a few areas which are reserved to the Government, such as the salt and alcohol monopolies, Panama's industry was owned by private enterprise.

PRODUCTION

The only official Government statistics on mineral production were those for salt. Actual and estimated production of nonmetallic minerals and metal and nonmetal manufactures was obtained from the principal local producers.

---

[7] Where necessary, values have been converted from balboas (B) at the rate of B1.00 equals US$1.00.

Output of refined petroleum products as measured by sales of the one producing refinery increased from 13.1 million barrels in 1963 to 14.6 million barrels valued at approximately $41 million. Production of portland cement dropped 11.4 percent due to the slackening of construction activities. The approximate value of cement production based on plant prices for Type 1 portland cement was $3.8 million. The production, refining, and distribution of salt, produced by evaporation of sea water, is under control of the Panamanian Government's Institute for Economic Development. 1964 output of 247,606 100-pound bags marked a record high. Based on the known value of 1962 output, the value for 1964 was estimated at $352,753.

TABLE 18.—Panama: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:[1]					
Aluminum extrusions, pipe, tubes, bars, etc.				45	360
Steel reinforcing rods and small shapes			[e] 4,000	[2] 6,350	[2] 12,500
Nonmetals:[3]					
Asbestos cement[1]	NA	NA	NA	[e] 545	409
Cement	108,941	113,867	122,406	141,713	125,178
Clay and shale[e]	30,000	30,000	35,000	35,000	45,000
Limestone and siltstone, for cement	193,563	202,316	[e] 210,700	[r] 217,748	[e] 211,700
Salt	6,514	7,729	10,499	10,082	11,231
Mineral fuels: Petroleum refinery products:					
Motor gasoline thousand 42-gallon barrels			1,192	2,241	2,047
Jet fuel do			30	200	375
Kerosine do			628	524	581
Distillate fuel oil do			1,381	4,398	4,525
Residual fuel oil[4] do			3,119	6,368	6,714
Other do			307	NA	367

[e] Estimate. [r] Revised. NA Not available.

[1] Fabricated or processed from imported raw materials.

[2] Fiscal year ending Oct. 31.

[3] Panama also produces about 170,000 cubic yards of sand, and unknown quantities of gravel and crushed rock.

[4] Does not include fuel oil consumed in refinery.

TRADE

The latest available complete official figures published were those for 1962 in the Anuario de Comercio Exterior, of the Dirección de Estadística y Censos. With the exception of petroleum products, there are only occasional and very limited exports of minerals or mineral products from the Republic of Panama. The statistics generally reflect the fact that Panama imported a wide variety of minerals and mineral products, but that few were imported in large volume. Minerals and mineral products used in the construction and building trades comprised a major part of the imports exclusive of crude oil and refined petroleum products. The boom of recent years in construction and building reached new heights in 1963, and undoubtedly resulted in higher imports of most of those commodities during that year.

Although a breakdown of import and export figures by country of origin and destination was not available, preliminary figures on value of total imports and exports for 1964 were placed at $168.1 million and $59 million, respectively. Corresponding figures for 1963 were $162.6 million and $47.5 million, respectively.

TABLE 19.—Panama: Exports and reexports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	Principal destinations, 1962
Exports:			
Nonmetals: Cement	5	--------	
Mineral fuels:			
Petroleum refinery products thousand 42-gallon barrels	--------	4,753	United States 1,927; Canal Zone 953; Argentina 907.
Reexports:			
Metals:			
Copper sulfate	858	73	All to Costa Rica.
Gold, bars and ingots troy ounces	354	--------	
Iron and steel:			
Scrap	5,067	1,000	All to Japan.
Primary forms	--------	2	All to Honduras.
Semimanufactures	71	50	Dominican Republic 29; Ecuador 10.
Nonferrous scrap	575	623	Japan 288; Spain 79; United States 72.
Platinum, unworked troy ounces	--------	129	All to Colombia.
Silver, bars, sheet, wire do	9,067	--------	
Nonmetals: Lime	576	7	All to Honduras.
Mineral fuels:			
Petroleum refinery products:			
Aviation gasoline 42-gallon barrels	4	--------	
Lubricants do	37	30	Costa Rica 25.
Other	17	--------	

Source: Anuario de Comercio Exterior, 1961 and 1962.

TABLE 20.—Panama: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	Principal sources, 1962
Metals:			
Aluminum, semimanufactures	386	362	United States 290.
Copper and alloys:			
Sulfate	2,544	11	Costa Rica 9; United States 1.
Semimanufactures	168	119	United States 71; Canada 28.
Gold, all forms troy ounces	5,144	--------	
Iron and steel:			
Pig	--------	1	Mainly from United States.
Scrap	464	607	Canal Zone 605.
Ferroalloys	--------	2	United States 1; West Germany 1.
Primary forms	--------	2,588	West Germany 1,552; Belgium 1,000.
Semimanufactures:			
Bars, rods, and shapes	16,084	4,601	Belgium 3,478; United States 544.
Plates and sheets, all types	6,135	8,526	United States 4,237; Japan 2,703; Belgium 1,006.
Pipe and tubes	6,614	9,462	Guatemala 2,087; United States 1,931; Costa Rica 1,920.
Other	771	2,329	Guatemala 1,213; Costa Rica 456; Belgium 356.
Lead metal, all forms	92	166	Denmark 113; United States 43.
Platinum and platinum-group metals. troy ounces	3,012	353	United States 225; Mexico 128.
Silver, bars, ingots, sheets do	2,476	9,259	All from United States.
Tin metal, all forms long tons	--------	27	West Germany 10; Netherlands 7.
Zinc metal, all forms	13	20	Belgium 15; United States 4.
Other nonferrous metals	--------	1	Mainly from United States.
Nonferrous scrap	29	313	All from Canal Zone.

TABLE 20.—Panama: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	Principal sources, 1962
Nonmetals:			
Asbestos, raw, washed or ground	--------	187	Canada 181.
Abrasives:			
Emery, corundum, pumice	--------	60	Italy 51; France 5.
Industrial diamond carats	--------	20,000	All from United States.
Cement:			
Portland	--------	1,394	Dominican Republic 850; West Germany 522.
White	1,573	1,588	United Kingdom 1,037; France 214.
Clays:			
Unprocessed	747	240	All from United States.
Refractory bricks	--------	626	United States 623.
Fertilizers:			
Natural:			
Phosphate rock	1	2	All from Denmark.
Sodium nitrate	--------	10	All from Chile.
Manufactured:			
Nitrogenous	14,905	11,649	Netherlands 7,275; Belgium 3,356.
Phosphatic	685	1,577	Netherlands 963; Belgium 347.
Potassic	457	460	West Germany 204; United States 186.
Mixed	3,264	3,277	Free Zone of Colon 1,476; Netherlands 1,473.
Gypsum:			
Crude	6,150	5,074	Dominican Republic 2,785; Mexico 1,275.
Calcined	17	875	Dominican Republic 850.
Infusorial earth, not as abrasive	--------	118	United States 115.
Lime	2,587	357	United Kingdom 205; United States 133.
Marble, block and ground	281	313	Italy 305.
Mica, untrimmed	1	1	All from West Germany.
Salt, all types	268	287	West Germany 100; United States 73.
Sand	440	149	United States 99; Belgium 50.
Sodium carbonate	--------	160	United Kingdom 83; United States 77.
Sodium hydroxide	644	1,024	United Kingdom 506; United States 347.
Stone:			
Dimension, worked and unworked	--------	78	United States 75.
Industrial	284	227	Italy 212; United States 10.
Sulfur	4	8	Netherlands 3; West Germany 3.
Talc	114	208	United States 167; West Germany 16.
Other nonmetal minerals	2,106	9	United States 7; United Kingdom 2.
Mineral fuels:			
Coal, coke and briquets	335	241	United States 158; West Germany 69.
Mineral tar	--------	9	Canal Zone 7.
Petroleum:			
Crude and partially refined thousand 42-gallon barrels	--------	8,164	Venezuela 5,286; Libya 1,157.
Refinery products:			
Aviation gasoline do	175	136	All from Canal Zone.
Motor gasoline do	774	539	Canal Zone 534.
Jet fuel do	220	330	All from Canal Zone.
Kerosine do	264	178	Canal Zone 175.
Distillate fuel oil do	479	320	Canal Zone 218; Curacao 102.
Residual fuel oil do	955	1,099	All from Canal Zone.
Lubricants including greases	5,077	5,150	United States 4,575; Curacao 371.
Other	4,294	4,450	Canal Zone 3,148; United States 1,269.

Source: Dirección de Estadística y Censos, 1961 and 1962.

Although complete mineral commodity trade data are not available for 1963–64, some statistics on petroleum product trade were available.

Unfortunately, as in past years, the available statistics on exports of petroleum products require two qualifications that severely restrict their usefulness as a precise tabulation of true exports. The major qualification applies to listed exports to the Canal Zone inasmuch as a considerable, but undetermined, quantity of these products is merely stored in the Canal Zone for later sale in the domestic Panamanian market, and thus were not true exports. The Panamanian Government compiles its trade statistics on the basis of figures submitted by the refinery while the company, although knowing the quantity shipped to the Canal Zone for temporary storage, has no way of knowing what portion of those quantities sold from storage goes to bunker sales and what portion is brought back into Panama by dealers for domestic sale. Products returned to the Republic for sale to the domestic market are not counted as imports. Following are official Government of Panama figures on value of exports of petroleum products to the Canal Zone in 1962, 1963, and 1964, subdivided according to final destination or use:

(Value in millions of dollars)

Year	Total exported to Canal Zone [1]	Portion sold in Canal Zone [1]	Portion sold as bunkers [1]	Portion re-exported to Panama for retail sale [2]
1964	13.4	4.3	4.0	5.1
1963	9.8	6.5	1.8	1.5
1962	6.5	2.3	1.1	3.1

[1] Source: Office of Comptroller General, Republic of Panama.

[2] Source: Obtained by subtracting sales from total exported to Canal Zone.

TABLE 21.—Panama: Exports of refinery products [1]

Destination	Quantity (thousand 42-gallon barrels)	Value f.o.b. (U.S. dollars)
Argentina	268	$890, 777
Belgium	116	385, 256
Canada	2, 473	8, 498, 192
Costa Rica	7	23, 259
Federal Republic of Germany	138	458, 972
Japan	104	317, 672
Netherlands	1, 058	3, 511, 158
Nicaragua	1	3, 348
United Kingdom	302	1, 114, 617
United States	2, 477	5, 465, 923
Canal Zone	1, 835	4, 272, 257
Total	8, 779	24, 941, 431

[1] Jet fuel sold for consumption as international bunkers at Tocumen Airport is not included.

TABLE 22.—Panama: Imports of petroleum commodities

(Thousand 42-gallon barrels unless otherwise specified)

Commodity	1963		1964	
	Quantity	Value f.o.b. (U.S. dollars)	Quantity	Value f.o.b. (U.S. dollars)
Crude oil	14, 704	$33, 030, 029	14, 933	$33, 725, 250
Refinery products:				
Aviation gasoline	133	826, 452	32	193, 152
Motor gasoline	48	222, 493	5	25, 070
Jet fuel	142	663, 890	-------	-------
Kerosine	13	61, 563	9	43, 060
Distillate fuel oil	95	269, 100	146	426, 636
Residual fuel oil	642	1, 281, 589	225	444, 826
Lubricants, including greases ..... metric tons	6, 247	1, 085, 816	4, 520	807, 419
Gasoline additives ..... do	12	12, 199	-------	-------
Other ..... do	1, 864	227, 211	1, 309	171, 381

The less serious qualification is the fact that sales of jet fuel for international bunkers at Tocumen Airport are not counted as exports. The refinery produced 378,100 barrels of this product during 1964, practically all of which undoubtedly was sold at Tocumen.

Nine-tenths of total Panamanian exports by value have traditionally gone to the United States, and well over half of total imports by value have been of U.S. origin. The oil refinery with its imports of crude oil and exports of refined petroleum products has changed this pattern since none of the crude petroleum imports came from the United States and only about 22 percent of the petroleum products exported went to the United States. Venezuela, long of minor importance as a supplier to Panama, in 1962 became the second most important source of Panamanian imports, due primarily to crude oil shipments. Although trade with other Central American republics has been of relatively minor importance, the Government of Panama at yearend was carefully considering the association of Panama with the Central American Common Market.

COMMODITY REVIEW

Metals.—*Aluminum Products.*—Ingenieria Amado, S.A. operated the only aluminum extrusion plant in Panama and produced various types of aluminum tubing, conduit types, frames, jalousies, and bars. Although the plant operated at less than 20 percent capacity during the year, the owner undertook certain improvements. Local sales were affected by the presence of large stocks of aluminum products imported in late 1963 by local users fearful of a sharp rise in prices when import quotas were established to protect local production.

Iron and Steel.—Iron and steel industry facilities consisted of one steel rolling mill, employing about 50 persons, and several small nail factories. The steel rolling mill, using ingots imported primarily from Venezuela, produced sufficient steel reinforcing rods during the year to completely meet local demands. Some small steel shapes also were produced. In accordance with its contract with the Panamanian Government, the local company, Cía. Siderurgica Panama, S.A., was obligated to undertake an expansion of its local facilities, and therefore purchased a Brown Boveri electric furnace. The expansion program which will cost approximately $1 million will be completed within 3 years, and will bring the total investment of the company to $3.5 million. Plant capacity, currently 150 tons per day, will be approximately doubled. In 1964 the plant operated at about one-third to one-half capacity but the management planned to diversify its products and capture a larger share of the domestic and Central American markets for steel products.

Nonmetals.—*Cement.*—Cemento Panama, S.A., was the only producer of portland and asbestos cement in 1964. Limestone and siltstone requirements for Cemento Panama's facility were supplied from its own quarries. All gypsum used by the company was imported. Cemento Panama also operated an asbestos cement plant at the same site using asbestos imported from Canada.

A new cement plant was under construction near Colón by Cemento Atlantico, S.A., and production was scheduled for early 1965 using coral as the basic raw material. Cemento Atlantico will employ German-made vertical kilns and will produce an estimated 600 tons per day.

Clays.—Panama's one major clay products manufacturer, Cía. de Productos de Arcilla, S.A., produced about 98 percent of its requirements for clay and shale, importing the remainder. Imports normally include pyrophyllite from Canada, kaolin and talc from the United States, and glazes from both the United States and Mexico.

A relatively small amount of clay also was produced by some 15 to 20 small brick and tile producers scattered throughout Panama, but no reliable estimate of their annual production was available.

Sand and Gravel.—Sand and gravel was produced in sufficient quantity to meet local demand. The Panamanian Government operated several rock quarries to meet its requirements for gravel and crushed rock while attempting to exert some control over production by privately owned quarries. No estimate of 1964 gravel production was available. A local industry source estimated that Panama's annual production of sand was approximately 170,000 cubic yards.

Mineral Fuels.—*Petroleum.*—No petroleum exploration or drilling was conducted in Panama during the year although it was reported that British interests, the Golden Eagle Refining Co. of Panama, continued to retain the services of an exploratory petroleum geologist in the western area of the Republic.

Early in 1964, Caribbean Gulf Oil Co. released its last concession area in Panama, the Senosri block, totaling 115,000 hectares in Bocas del Toro Province in the northwestern corner of the country. There were no other acreage releases reported, and 18 concessions totaling about 2,550,000 hectares were held by various local individuals and Panamanian companies at yearend.

Refineria Panama, S.A., was the only petroleum refinery in Panama during 1964. According to figures released by the Panamanian Government, major petroleum imports were limited to lubricating oils and liquefied petroleum gas, neither of which was produced at the refinery, and residual fuel oil and diesel oil imported by a few firms holding exemptions from the protective tax levied on all petroleum imports. Also, according to official Government statistics, the value of Panamanian crude oil imports was $33.7 million and exports of refined products were $24.9 million. These figures were in conflict with those available from other sources. The refinery estimated its export sales during the year at $34.21 million, including $13.5 million to the Canal Zone, almost one-half of which undoubtedly returned to Panama.

TABLE 23.—Panama: Sales of petroleum products by refinery

	Quantity (thousand gallons)	Value (U.S. dollars)
Exports:		
To Canal Zone [1]	244,178	$13,544,600
To other countries	292,364	20,669,100
Local sales	77,951	6,684,800
Total sales	614,493	40,898,500

[1] Products exported to Canal Zone are used for international bunkers, sold within Canal Zone, or reexported to the Republic of Panama.

Source: Refineria Panama.

An estimate of domestic consumption of petroleum products in 1964 follows:

	Thousand barrels
Aviation gasoline	148
Motor gasoline	980
Jet fuel	378
Kerosine	285
Distillate fuel oil	457
Residual fuel oil	818
Lubricants, including greases	NA
Asphalt	36
Liquefied petroleum gases	42
Total (excluding lubricants and greases)	[1] 3,145

NA Not available.

[1] Approximately 90 percent of this quantity was locally refined products. Detail does not add to this total because of rounding.

Source: Refineria Panama, S.A.

The Mineral Industry of the Islands of the Caribbean

By Frank E. Noe, Sumner M. Anderson, and Benjamin H. Lim

◆

Contents

	Page		Page
Cuba	103	Jamaica	123
Dominican Republic	109	Netherlands Antilles	133
Haiti	118	Trinidad and Tobago	140

CUBA [1]

RELIABLE, comprehensive data on the activities of the Cuban mineral industry continued to be unavailable in 1964. Some unverified data were released in various forms by Cuban Government sources, and these, coupled with foreign trade statistics and occasional spot news items released by European Communist countries through various media, indicate generally a continuation of output at levels about on a par with those reported for 1963. Significant expenditures and efforts to expand and diversify production apparently were being made in virtually all sectors of the industry, but the relative success of these efforts was not clearly indicated. Development of a domestic iron and steel industry, expansion and modification of nickel and cobalt production, and increased cement, feldspar, and crude oil production were among the goals that apparently were set, but only in the case of oil was there any indication of accomplishment.

PRODUCTION

Except for the partial production figures for nickel and cobalt given in the Commodity Review section of this chapter, there have been no statistics reported pertaining to production since 1960. All nonferrous metal ores and concentrates presumably are still exported; therefore, production has been assumed to be equivalent to exports. Partial statistics available for nickel, the metal receiving major production emphasis, indicate that 1964 production was approximately the same as in 1963; any statement on the production of other commodities would be pure speculation.

---

[1] Prepared by Frank E. Noe, Latin America specialist, Division of International Activities.

TABLE 1.—Cuba: Estimated[1] production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Chromite, refractory grade	[2] 29,732	25,000	35,000	50,609	NA
Cobalt in nickel sulfides	62	----------	164	174	NA
Copper in concentrate	[3] 11,846	5,000	5,500	6.000	6,000
Gold troy ounces	[2] 348	NA	NA	NA	NA
Iron ore	2,500	2,000	1,000	650	NA
Manganese ore:					
Chemical grade, 81 percent MnO_2	1,000	NA	NA	3,300	NA
Metallurgical grade, 35 to 45 percent Mn	15,006	NA	NA	72,400	NA
Total	16,006	[r] 42,000	[r] 75,000	75,700	75,700
Nickel:					
In oxide with cobalt, recoverable	[4] 11,382	14,805	14,716	14,700	14,800
In sulfide, recoverable	1,460	----------	1,887	2,000	2,200
Total	[4] 12,842	14,805	16,603	16,700	17,000
Silver troy ounces	[2] 121,415	NA	NA	NA	NA
Zinc, in concentrate	[2] 70	----------	----------	----------	----------
Nonmetals:					
Cement thousand tons	400	300	300	350	350
Feldspar	----------	----------	----------	800	NA
Gypsum	26,000	19,000	19,000	22,000	NA
Kaolin	500	1,000	3,000	5,800	NA
Limestone thousand tons	2,200	2,000	2,000	2,100	NA
Pyrite, 48 percent sulfur	18,000	20,000	26,000	33,700	30,000
Sulfur content	[r] 8,000	[r] 9,000	[r] 11,700	[r] 15,200	13,500
Salt thousand tons	59	60	70	80	NA
Mineral fuels: Petroleum:					
Crude[5] thousand 42-gallon barrels	108	80	90	72	80
Refinery products:					
Gasoline do	6,152	4,780	6,170	6,500	NA
Kerosine do	1,028	1,090	1,280	1,400	NA
Distillate fuel oil do	4,472	3,910	4,790	5,000	NA
Residual fuel oil do	10,558	10,440	12,400	13,000	NA
Other do	672	870	800	800	NA
Total do	22,882	21,090	25,440	26,700	NA

[r] Revised. NA Not available.

[1] Unless otherwise noted. In addition to listed commodities, Cuba may have produced iron and steel from newly established facilities.

[2] U.S. imports from Cuba.

[3] Exports.

[4] Exclusive of an unknown tonnage produced and stored at Nicaro after September 20 but believed to have been included in 1961 figure.

[5] Includes natural gasoline, if any.

TRADE

Preliminary data indicate that the value of total trade with the Soviet Union, Cuba's largest foreign market, increased from $558.6 million[2] in 1963 to $649.8 million in 1964. Although complete year figures were not available for other trading partners, in the first 9 months of 1964 Cuba's total foreign trade (imports and exports) amounted to $1,330 million, 39 percent higher than in the same period in 1963 and higher than the figure for all of 1962. Trade with mainland China increased from $107.8 million in the 9-month period of 1963 to $138.1 million for the same period in 1964.

Cuba also increased trade with several Western nations, including the United Kingdom, Spain, Canada, and West Germany. Her trade with the United Kingdom was worth $48 million from January to September, the highest for the last 5 years. Trade with Japan also rose to over $65 million in the same period of 1964, putting Japan in 4th place on Cuba's trading list. Cuba's trade with Africa doubled from 1963 to 1964, particularly due to the development of trade with the Kingdom of Morocco. Morocco, after the U.S.S.R. and mainland China, is one of the largest markets for Cuban sugar and other products, exports of which were worth $57 million in the first 9 months of 1964. Trade with the United Arab Republic increased from $19 million to $26.6 million, comparing the first 3 quarters of 1963 with the same period for 1964. The increase in Cuban trade with Algeria and Mali was from $900,000 to $20.7 million. Trade with Uruguay, which later severed relations with Cuba, amounted to $6 million in the first 9 months of 1964, and trade with Mexico was approximately $25 million for the same period.

---

[2] Where necessary, values have been converted from pesos to U.S. dollars at the rate of 1 peso equals US$1.00, and from rubles to U.S. dollars at the rate of 1 ruble equals US$1.10. In some cases, values have been left in units reported rather than being converted because of the questionable nature of the reported data.

Cuba's foreign trade, by value and by sectors, for 1962 and 1963, was reported as follows, indicating an increasingly unfavorable trade balance:

	Value (thousands of pesos)		
	Communist Countries	Other	Total
Imports, c.i.f.:			
1962	641, 900	97, 300	739, 200
1963	703, 613	163, 670	867, 283
Exports, c.i.f.:			
1962	426, 900	93, 700	520, 600
1963	366, 281	177, 562	543, 843

Source: Revista Trimensual del Ministerio del Comercio Exterior de Cuba. Abril-Junio 1964, v. II, No. 2.

According to the quarterly publication of the Ministry of Foreign Commerce of Cuba, the export of metallic minerals—nickel, copper, manganese, chromium, and iron—has represented 3.8 to 5.3 percent of total exports of Cuba. In 1963, the latest year for which detailed data are available, the mineral exports to Communist countries amounted to $35 million, as follows:

TABLE 2.—Cuba: Reported exports of minerals to Communist countries in 1963

Commodity	Quantity (metric tons)	Value (thousand US$)
Copper concentrate	16, 349	2, 250
Manganese ore:		
Chemical grade	2, 928	135
Metallurgical sinter	49, 513	1, 180
Nickel and cobalt:		
Oxide	1, 501	1, 882
Sulfide	9, 095	5, 422
Sinter	16, 485	24, 278

Source: Ministry of Foreign Commerce, Office of Planning and Statistics. 1963 Statistics Summary for Cuba.

According to Soviet sources, Cuban exports of ores and concentrates to the U.S.S.R. in 1964 were valued at 26 million rubles, 30 percent more than in 1963. The comparable figure for 1962 was not given. Although commodity detail was not available, preliminary Soviet data indicate that Cuban imports of minerals and metals from the U.S.S.R. in 1964 were valued at 87 million rubles, as compared with 79 million rubles in 1963 and 85 million rubles in 1962. The marked decrease in 1963 imports of pig iron and rolled steel products shown in the following table may indicate that Cuba has been at least partially successful in establishing a steel industry.

TABLE 3.—Cuba: U.S.S.R. mineral exports to Cuba

(Metric tons unless otherwise specified)

Commodity	1962		1963	
	Quantity	Value (thousand rubles)	Quantity	Value (thousand rubles)
Metals:				
Aluminum and alloys, all forms	4,900	3,477	4,400	3,047
Copper and alloys, all forms	3,300	3,276	3,900	3,445
Iron and steel:				
Pig iron	47,800	2,052	17,900	709
Ferroalloys	4,100	461	2,700	341
Semimanufactures:				
Pipe	14,700	2,281	22,500	4,115
Tinplate	26,200	5,813	21,400	4,202
Other rolled steel	159,300	14,038	59,900	7,956
Lead	-----	-----	2,700	427
Nonmetals:				
Asbestos	5,200	826	3,700	528
Cement	107,000	1,369	• 155	2
Fertilizer:				
Superphosphate	104,400	1,691	70,600	1,058
Potassic	65,500	1,310	58,200	1,128
Refractory materials	10,700	1,030	3,500	382
Sulfur	64,700	1,154	38,900	592
Mineral fuels:				
Anthracite coal .... thousand tons	-----	-----	11	107
Coke .... do	24	406	28	433
Petroleum, crude .... do	3,629	32,321	3,766	39,064
Petroleum refinery products:				
Gasoline .... thousand tons	186	5,025	189	4,892
Distillate fuel oil .... do	94	1,803	11	226
Residual fuel oil .... do	425	3,131	198	1,930
Lubricants, including greases .... do	46	3,511	54	4,189
Paraffin	1,600	194	2,000	270

• Estimate.

Source: Vneshnyaya Torgovliya S.S.S.R. za 1963 god (Foreign Trade of the U.S.S.R. for 1963).

Polish-Cuban trade transactions according to Cuban sources amounted to about $33 million in 1963, of which $18.3 million represented Cuban exports and $14.9 million Cuban imports. Cuba supplied Poland with metallurgical grade manganese ore (27,200 tons), chemical grade managanese ore (500 tons), copper concentrate (1,935 tons), and nickel oxide (300 tons). The value of these mineral exports was approximately $2 million. Poland supplied Cuba primarily with machinery and equipment, which in 1963 consisted of metal-working machinery and replacement parts, motor vehicles, electric motors and replacement parts, and $1.3 million worth of chemicals and pharmaceuticals. Details on the value of overall Polish-Cuban trade from 1960–63 according to Polish sources were as follows:

	Value (thousand zloty[1])			
	1960	1961	1962	1963
Cuban exports	39,026	97,540	76,375	69,407
Cuban imports	16,323	90,238	81,172	96,968

[1] One zloty (Zl) equals US$0.25.

Source: Statystyka Handlu Zagranicznego—1963 supplement to 1964 issue of Handel Zagraniczy.

Cuban-Hungarian trade amounted to approximately 24.2 million pesos in 1963. Hungary exported machines and industrial equipment and imported copper concentrates, sugar, and textile materials. Trade between Hungary and Cuba has developed as follows:

	Value (thousand pesos)			
	1960	1961	1962	1963
Cuban exports	165	1,460	10,000	12,010
Cuban imports	935	8,153	12,600	12,173

Source: Comercio Exterior, La Habana, 1964, v. 2.

Cuba and mainland China signed a trade and payment pact late in December which included the sale of 10,000 tons of nickel oxide in exchange for rice, soy beans, canned meat, and other products. Presumably, the nickel oxide is to be supplied at the rate of 2,000 tons for each year of the 5-year treaty.

On July 22 the Cuban Minister of Foreign Trade signed a supplement to the existing Cuban-Czechoslovakian trade agreement. The supplement, according to the Czech publication, Rude Pravo, provided for Czechoslovakian imports of Cuban sugar, unspecified minerals, and consumer goods in exchange for Czechoslovak machinery.

Cuba has established a number of foreign trade organizations with headquarters in Havana to conduct all foreign buying and selling. Cuba Metals is the agency for export and import of ores, concentrates, and metals. Cuba Metals is divided into four sections. The first deals in imports of ferrous metals only and handles everything from pig iron to steel wire. Section 2 is responsible for import of all nonferrous metals and their products. Section 3 is both an importer and exporter of minerals and marble. All Cuban-produced ores and concentrates are sold by this section. Nickel, the most important mineral commodity, is sold in three forms: sintered nickel oxide, nickel oxide powder, and nickel sulfide. Twenty-two key mineral products are imported by the agency. Section 4 imports liquid and solid hydrocarbons required by the Cuban economy.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Early in 1964 it was reported that two open hearth furnaces had been built at the Uralmash works in the U.S.S.R. for delivery to Cuba where the steel production capacity was to be raised to 350,000 tons per year. It was also reported that the José Marti steelworks near Havana was being reconstructed with Soviet aid.

Nickel and Cobalt.—The deputy chief of the Soviet Committee for Ferrous and Nonferrous Metallurgy visited Cuba early in the year, reportedly to study plans for the construction of a new nickel plant in Oriente Province, near Comandante Rene Ramos Latour, the formerly U.S.-owned nickel facility (Nicaro). It was also reported that a lack of titanium piping had created a maintenance problem in the Pedro Sota Alba (Moa Bay) nickel concentrating plant and that Soviet engineers temporarily overcame the problem with tubing made from Japanese titanium. Later they were said to have switched to plastic pipe.

Nickel facilities were reported to be operating at over 50 percent of capacity. Cuban newspapers reported that the Pedro Sota Alba plant had produced 12,705 tons of nickel-cobalt sulfides during 1964, or 28 percent of capacity. Content of nickel and cobalt was 6,350 and 629 tons, respectively. Production of nickel at Rene Ramos Latour was not reported, but the unofficial yearly average for the period 1961–63 has been 9,102 tons.

According to ECONOMIA, a publication of the Cuban Association of Economists (in exile), extraction of cobalt from the Pedro Sota Alba nickel-cobalt sulfides was commenced in November 1964 at the city of Ordzhonikidze in the northern Caucasus, U.S.S.R. It also reported that Czechoslovakia was employing a process first used in Cuba. Under this process a nickel carbonate is produced and then dissolved in sulfuric acid and electrolytically processed by utilizing a porous diaphragm to obtain electrolytic nickel.

Nonmetals.—Cement production was to be increased with the purchase from Rumania of three units with an output capacity of 600 tons per day.

Cuba has been receiving shipments of fluorspar from Mozambique, presumably for use at the José Marti steelworks.

Tekhnoeksport has delivered to Cuba a complete plant for the production of calcium carbide and a beneficiation plant for feldspar. Negotiations were underway at yearend for the supply of other complete enterprises.

During the first half of 1964, Italy exported 3,448 tons of fertilizer to Cuba.

Mineral Fuels.—*Petroleum.*—The geophysical work in the North Cuba Evaporite Basin, started in 1962, continued through 1964. One test well on Cayo Frances reached a total depth of 14,881 feet, and at yearend two additional deep tests were drilling in other areas at depths of 16,000 and 13,000 feet. Geophysical work and development drilling also continued in the Central Cuba Tertiary Basin where the Jatibonico, Cristales, and Catalina fields were producing. A total of 113,723 feet of hole was drilled during the year, and, at yearend, eight rigs were in operation—four on wildcats and four on development. No new fields had been discovered, but existing fields were being worked intensively, especially Jatibonico, where secondary recovery methods were being started, and Bacuranao, where a new area was being developed. A well drilled to investigate the section below the serpentine at Bacuranao (east of Havana) passed through the serpentine and encountered sedimentary conglomerates and sandstones at a depth of 5,000 feet, with very good shows and interesting electric log values. Total depth reach was 7,665 feet, and the well was being tested.

The U.S.S.R. increased deliveries of refined products to Cuba, but shipments of crude apparently declined during the year. The official publication of the U.S.S.R.'s Ministry of Foreign Trade reported that the Soviet Union exported about 3.4 million metric tons of crude oil and 1.1 million metric tons of refinery products to Cuba in 1964, compared with 3.8 million tons of crude and 454,300 tons of products in 1963.

Shipment of Soviet oil-drilling equipment to Cuba increased, although both the Soviet Union and Cuba were significantly silent about the results of stepped up exploratory drilling. Cuba had counted on its Soviet-aided exploration program to increase domestic crude production from a reported 43,300 metric tons in 1962 to 300,000 metric tons in 1965. Actual production by fields follows:

Field	Wells drilled	Production (42-gallon barrels)	
		1963	1964
Cristales	49	117,224	134,834
Jatibonico	43	61,125	83,244
Jarahueca	50+	7,515	8,022
Motembo	1,000+	2,448	2,088
Bacaranao	50+	10,275	24,318
Peñas Altas	6	3,193	1,148
Cruz Verde	20+	6,370	2,610
Sta. Maria del Mar	6	8,120	5,144
Total	1,224	216,270	261,408

SOURCE MATERIALS

Information contained in this chapter was obtained mainly from foreign trade publications of Cuba, the U.S.S.R., and Poland, and from various periodicals such as World Mining, Metal Mining and Processing, the Metal Bulletin, the Bulletin of the American Association of Petroleum Geologists, Petroleum Management, and Comercio Exterior de Mexico published by the National Bank of Foreign Commerce, Mexico. Data pertaining to nickel and cobalt production were obtained from ECONOMIA, published by the Cuban Association of Economists (in exile).

DOMINICAN REPUBLIC[3]

Official compilation of basic economic data in the Dominican Republic during 1963 and 1964 was interrupted by the political upheaval of early 1965, and production trends for some of the mineral commodities have been conjectural. However, available company statistics showed that production of bauxite—the most important mineral product of the Republic—maintained an upward trend that has been broken only once (in 1962, without break in the constant rise of exports) since its inception in 1959. The Dominican Republic was again the fourth largest of the six Latin American producers in 1964, accounting for 5.2 percent of that area's output, 4.7 percent of that of the Western Hemisphere, and 2.4 percent of total world production. Among the world's 28 producing countries, the Dominican Republic ranked 12th. No other mineral product of the country was of significant world importance, but nickel may become so. The most significant metallurgical event of the year was the initial success of a ferronickel pilot plant at Maimón, in the center of the country.

---

[3] Prepared by Sumner M. Anderson, chief Latin America specialist, Division of International Activities.

Except for drastic diminutions in output of gypsum and salt, the importance of mineral production and the portion of manufacturing that is predominantly dependent on metal and mineral production are presumed to have been approximately the same relative to total industrial production in 1964 as last reported in 1962 and herewith tabulated.

In that year the production of mineral raw materials, in decreasing order of value, included bauxite, salt, gypsum, sand, limestone, gravel, clays, marble, granite, travertine, amber, and stone of unspecified type. The combined sales value of these raw materials was 3.7 percent of the total value of industrial production as defined in the table, and the combined capital investment of basic mineral producers was somewhat greater than 7.2 percent of the capital invested in total industrial production. Sales of domestically manufactured metal and mineral products amounted to 4.8 percent of the total industrial output. Cement (second only to bauxite in value) led the field, followed by metal manufactures, chemical fertilizers, glass products, and clay products. The metal manufactures were made entirely from imported metal; essentially all other mineral products were processed or manufactured from domestic raw materials.

TABLE 4.—Dominican Republic: Metal and mineral producing, processing, and fabricating industries in 1962

	Number of establishments	Capital investment (U.S. dollars [1])	Value of sales (U.S. dollars [1])
Raw materials:			
Metallic ores:			
Bauxite	1	16,994,612	8,712,895
Iron ore	1	100,000	----------
Nonmetallic minerals:			
Amber	(2)	(3)	400
Clays	NA	NA	13,057
Granite	NA	NA	6,987
Gravel	NA	NA	117,311
Gypsum	1	5,000,000	1,097,167
Salt			1,597,435
Limestone	NA	NA	252,378
Marble	(4)	(4)	10,076
Sand	NA	NA	278,235
Stone, type not specified	NA	NA	361
Travertine	NA	NA	2,911
Total raw materials	NA	NA	12,089,213
Manufacturers:			
Metal:			
Batteries	2	150,000	312,526
Doors, window frames, awnings, blinds, and moldings:			
Aluminum	NA	NA	544,905
Iron	NA	NA	2,994
Metal, type not specified	NA	NA	239,255
Total	5	924,100	787,154
Iron and steel, other than doors, windows, and furniture:			
Foundry products	8	2,333,375	691,174
Forged products	19	6,930	371,959
Nails	2	205,000	483,791
Sheetmetal products	22	29,585	783,829
Total	51	2,574,890	2,330,753
Metal furniture, all types	3	26,500	236,069
Silver	11	4,340	3,705
Nonmetal:			
Amber articles	1	(3)	818
Asphalt, for paving	1	270,000	----------
Clay products:			
Bricks	10	254,633	92,338
Mosaic and tile	49	1,174,741	1,095,777
Pottery	1	50,000	3,080
Total	60	1,479,374	1,191,195
Chemical fertilizers	1	1,000,000	3,178,910
Glass and glass products	11	2,590,288	1,913,694
Gypsum products	1	300	3,482
Limestone and asbestos products:			
Asbestos cement	1	750,000	579,157
Cement, gray	1	8,000,000	4,377,122
Cement products	5	500	22,398
Lime (mortar)	1	350,000	170,362
Total	8	9,100,500	5,149,039
Marble products	1	511,613	155,462
Salt, ground	1	5,000	159,220
Total manufactures	157	18,636,905	15,422,027
Total mineral raw materials and manufactures	[5] (160)	[5] (40,661,143)	27,511,240
Total industrial production, excluding basic agriculture, fishing, repair shops, and personal services	2,223	306,646,340	324,527,863
Gross national product (preliminary), at current prices	----------	----------	773,200,000

NA Not available.

[1] RD$1.00 (peso) equals US$1.00.

[2] Included with manufacture of amber articles.

[3] Not separately capitalized.

[4] Included with manufacture of marble products.

[5] Minimum totals, excluding operations for which figures are not available.

Source: Dirección General de Estadística y Censos. Estadística Industrial de la República Dominicana, 1962. No. 13, 1965.

GOVERNMENT POLICIES AND PROGRAMS

The unsettled political situation following the successive displacements of Presidents Rafael Trujillo on May 30, 1961, and Juan Bosch on September 25, 1963, created considerable uncertainty about the economic development of the Republic. Determined efforts by the Provisional Government to stabilize and improve all sectors of the economy were partially frustrated by a series of disturbances, strikes, and demands for an early election, but by the end of the third quarter of 1964, a relatively high level of economic activity generally had been reached and a program of stabilization initiated.

The construction industry was expanding in response to the stimulus of foreign aid and loan financing; both government-owned and private mineral industry facilities were enlarged. New building block and tile factories were established at a rate of two or three a month, and plans were announced for the expansion of cement and metal working facilities and the construction of a petroleum refinery.

PRODUCTION

Reliable 1964 production or partial production figures for 7 of the 12 mineral raw materials known to be produced in the Dominican Republic have been supplied by their producers. On the basis of these data and of estimates, the production trend was stabilized or slightly upward for 10 of the items, but the drastic slump in output of 2 of the normally important minerals—gypsum and salt—gave a sharp downward trend to the mineral industry in total. Gypsum actually tripled the output of 1963 but was far below the level of preceding years. Except for bauxite data supplied by Alcoa, figures for 1960–62 were taken from Estadística Industrial de la República Dominicana, 1962, No. 13, published in 1965 by Dominican Dirección General de Estadística y Censos in Santo Domingo. Data for 1963–64 were transmitted by the United States Embassy in Santo Domingo.

TABLE 5.—Dominican Republic: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum ore (bauxite), dry equivalent:[1]					
Production	686,076	749,063	675,446	773,476	819,873
Shipments	641,352	711,760	717,111	773,088	760,290
Gold troy ounces	[2] 308	----------	----------	----------	----------
Iron ore, 60 to 65 percent Fe	122,745	----------	----------	----------	----------
Nonmetals:					
Amber kilograms	----------	[3] 98	[3] 61	[3] 261	[3] 320
Cement, gray	169,664	[r] 236,762	[r] 242,746	228,170	297,515
Clays [4]	15,133	13,213	12,603	[e] 12,000	[e] 12,000
Fertilizers, chemical	20,738	50,927	51,081	[e] 50,000	[e] 50,000
Gravel and crushed rock [4] cubic meters	50,121	36,246	52,464	[e] 50,000	[e] 50,000
Gypsum	324,700	408,765	439,406	35,318	109,695
Lime	7,539	6,475	7,433	[e] 7,000	[e] 7,000
Limestone [4]	216,596	317,723	311,831	[e] 310,000	[e] 400,000
Salt:					
Marine	19,518	20,099	9,896	[e] 10,046	NA
Mined	66,306	75,702	32,213	22,754	2,471
Total	85,824	95,801	42,109	[e] 32,800	[e] 12,500
Sand [4]	53,066	58,983	83,907	NA	NA
Stone, dimension and crushed:					
Granite [4]	261	137	244	NA	NA
Marble cubic meters	186	88	124	NA	(5)
Travertine do	121				

[e] Estimate. [r] Revised. NA Not available.

[1] Final adjusted figures of Alcoa, superseding those previously reported and given in commodity chapter volume I.

[2] U.S. imports from the Dominican Republic.

[3] Exports.

[4] Domestic consumption of national production.

[5] Production of quarried slabs reported as 3,757 square meters of marble and 3,757 square meters of travertine.

TRADE

In 1963, the latest year for which foreign trade statistics are available, ores and minerals supplied 5.7 percent of the value of total Dominican exports, and bauxite shipments represented 95.5 percent of the ores and minerals. By contrast, imports of metal and mineral products and mineral fuels represented 31.8 percent of the value of total imports. The total trade balance was the reverse of the balance for products of the minerals industry, as follows:

1963	Total trade	Ores, metal and mineral products, and mineral fuels
Exports	$174,275,000	$9,898,800
Imports	160,285,400	31,831,400
Balance	+13,989,600	−21,932,600

The only significant changes from 1962 in the mineral trade pattern were a sharp decrease in exports of gypsum and salt, and the displacement of the continental United States as principal customer for gypsum by Puerto Rico, and for salt by Panama.

TABLE 6.—Dominican Republic: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum ore: Bauxite	869,193	946,921	All to United States.
Aluminum manufactures (doors and window frames)	6	6	Netherlands 5; Surinam 1.
Iron and steel scrap	806	641	Puerto Rico 227; Japan 144; United States 143.
Nonmetals:			
Amber ... kilograms	61	261	West Germany 199; United States 62.
Cement	68,646	21,324	Puerto Rico 6,510; Virgin Islands 6,257.
Clay products:			
Brick	12	33	Puerto Rico 30; Virgin Islands 2.
Roofing tile	21	51	All to Puerto Rico.
Mosaic tile, glazed	204	9	All to Virgin Islands.
Artifacts of pottery	59	22	Netherlands 8; Virgin Islands 8; Puerto Rico 6.
Total	296	115	
Glass products	(1)	(1)	
Gypsum	394,564	48,768	Puerto Rico 38,188; Panama 6,280; Haiti 2,800.
Salt	26,582	142	Panama 141; Puerto Rico 1.
Stone, dimension:			
Granite	9	----------	
Marble	3	5	Mainly to Puerto Rico.
Travertine	49	----------	
Other types, not specified	7	----------	
Total	68	5	

[1] Less than ½ unit.

Source: Dirección General de Estadística y Censos. Comercio Exterior de la República Dominicana, 1963.

TABLE 7.—Dominican Republic: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Copper and its alloys and manufactures	833	1,004	United States 288; Canada 193; United Kingdom 153.
Gold, silver, platinum and their manufactures. kilograms	925	1,252	Japan 404; United States 300; Ireland 274.
Iron and steel products:			
Construction materials:			
Large pieces	3,215	3,510	United States 766; Belgium 731; West Germany 387.
Galvanized sheet	7,595	14,242	Belgium 5,268; Japan 4,013; France 2,449.
Other	13,104	13,703	Belgium 7,266; Netherlands 1,579; United States 1,497.
Total	23,914	31,455	
Rails and railway material	1,993	2,421	West Germany 1,327; Belgium 840; Netherlands 188.
Pipes and fittings	3,391	6,812	United Kingdom 3,990; West Germany 1,089; United States 639.
Wire, smooth	4,624	5,472	West Germany 2,683; Belgium 1,119; France 990.
Other manufactures:			
Cast iron	591	768	United States 308; West Germany 270; Finland 66.
Iron and steel, forged and malleable	12,119	12,896	United States 4,534; West Germany 2,508; Japan 1,337.
Total iron and steel products	46,632	59,824	
Tin, lead, zinc, and other metals and metal manufactures.	1,008	1,410	United States 465; West Germany 216; Puerto Rico 155.
Nonmetals:			
Cement	1,307	2,452	United Kingdom 1,409; West Germany 532; Japan 506.
Ceramics: China, procelain and pottery	2,949	3,606	Cook Island[1] 1,704; United States 1,072; Denmark 338.
Gem stones, unmounted carats	375,000	505,000	United States 315,000; Japan 85,000; West Germany 80,000.
Glassware and glass manufactures	7,478	8,767	United States 4,092; West Germany 2,374; Spain 540.
Stone, earth, and their manufactures	1,763	2,404	West Germany 1,269; United States 586; Canada 439.
Mineral fuels:			
Coal, coke, and briquets	513	637	United States 315; Netherlands 172; West Germany 126.
Petroleum products:			
Gasoline thousand 42-gallon barrels	854	1,197	Netherlands Antilles 1,093; Venezuela 72; Trinidad 31.
Kerosine do	152	253	Netherlands Antilles 227; Trinidad 10; United States 9.
Fuel oil do	1,702	1,500	Venezuela 896; Netherlands Antilles 591; Trinidad 12.
Lubricating oil (estimated)[2] do	46	50	United States 36; Netherlands Antilles 7; Netherlands 3
Other (estimated)[2] do	89	182	Venezuela 136; United States 21; Netherlands Antilles 19.
Total (estimated) do	2,843	3,182	

[1] Probably transient shipments originating in Japan.

[2] Officially reported in kilograms. Converted with an assumed factor of 6.3 barrels of 42 United States gallons each per metric ton.

Source: Dirección General de Estadística y Censos. Comercio Exterior de la República Dominicana, 1963.

COMMODITY REVIEW

Metals.—*Bauxite.*—Revised figures provided by the Aluminum Company of America show that the Dominican Republic operations of its subsidiary Alcoa Exploration Company produced 4,122,251 metric tons of bauxite, calculated to a dry equivalent, and shipped 4,007,688 tons from the year of first shipments in 1959 to the end of 1964. The average analysis of the 1964 shipments was Al_2O_3—48.62 percent, SiO_2—3.91 percent, and moisture (deducted in calculating the dry basis tonnage figure)—17.68 percent. Operations in 1964 were normal to the planned schedule. Production was from the Aceitillar mine (elevation 4,300 feet) and La Mercedes mine (elevation about 1,500 feet) on the southwestern slope of the Sierra da Bahoruco in Pedernales Province. A third deposit known as El Pon was worked in 1962–63. Shipments from the company port at Cabo Rojo, near the southern Haitian border, were all to the Alcoa alumina plant at Point Comfort, Tex., which has been the sole destination of previous shipments.

Nickel.—Minera y Beneficiadora Falconbridge Dominicana C. por A., a majority-owned subsidiary of Falconbridge Nickel Mines Ltd. of Canada, has been examining the nickel deposits of the Maimón-Loma Peguera-Bonao areas[4] of La Vega Province since acquiring its 300-square-mile concession in 1956. By 1959 the company was able to estimate reserves of 50 million tons of lateritic ore containing 1.55 percent nickel, and announced plans to construct a pilot plant in the Dominican Republic based on processing methods developed at the Falconbridge metallurgical laboratory at Richvale, Toronto. The pilot plant was built at Maimón and placed in operation in 1964. From laterite ore approximately 100 metric tons of ferronickel was produced and shipped to Canada and the United States for test and demonstration purposes; consequently, this has not been recorded as commercial production. Plans for further development have been deferred pending political stabilization.

Metal Manufactures.—The fabrication of iron and steel products in the Dominican Republic remained primarily a foundry and forging industry and secondarily a manufacturing industry producing such items as nails, window frames, tinplate and galvanized sheet products, and metal furniture. It was still entirely dependent on imported metal for raw material needs, as were the fabricators of aluminum, lead, silver, and possibly other metals. Output of finished products, in total, fell considerably short of meeting domestic market requirements, but production data have not been made available other than on a "value of sales" basis. Table 1 shows the number of establishments engaged in iron and steel fabrication in 1962. In 1964, a wire drawing (presumably copper) factory was inaugurated to produce the most widely used types and gauges of plastic insulated electric wiring. On July 31, the Industrial Development Corporation (CFI—Corporación de Fomento Industrial) signed a contract with Camer International, S.A., a Spanish firm, for seven light metal working plants, including a foundry, a tank and boiler factory, and factories to produce pipe and tubing, wrought iron work, light structural shapes, builders' hardware, and household utensils. CFI, a government agency, announced that all these industries except the foundry, as well as one plastics plant included in the contract, would be transferred in due course to private investors or operators.

---

[4] See Kochman, A. H. and Mackenzie, Gordon, Jr. Geology and Mineral Resources of the Maimón-Hatillo District, Dominican Republic. U.S. Geological Survey Bull. 964–D, 1950, pp. 347–352.

The total commitment of Camer International, S.A., was to be an investment of approximately $2 million in cash and $4 million in machinery and equipment, provision of technical assistance during the installations and initial periods of operations, and maintenance of a permanent advisory staff in the Dominican Republic. CFI was to provide a suitable site with utilities installed within 6 months of the contract date, and an additional $2 million (either private or government) of Dominican financing.

Nonmetals.—*Cement.*—In the latter part of 1964, the only operating cement company, Fábrica Dominicana de Cemeto, 72 percent owned by the Government through the Industrial Development Corporation, was producing at its capacity of 298,000 metric tons of cement per year. Increase of capacity to 554,000 tons was expected in 1965, to supply domestic requirements and a surplus for export. In addition, a private company was formed to build a second cement plant in the Santo Domingo area.

The local wholesale price of cement at the factory was $1.03 a bag, while the export price reportedly was $0.57 a bag. Nevertheless, the sharp drop in export sales (principally to Puerto Rico and the Virgin Islands) from 141,624 tons in 1961 to 21,324 tons in 1963 was attributed by industry sources to price competition with cement from Colombia.

Law 500 of November 20, 1964, regulated the sale of part of the export surplus to local nonprofit, self-help housing projects at the export price. CFI protested the law, and on November 26 it was rescinded by Law 511, authorizing CFI to set export prices and the Price Control Board to set prices in the domestic market, and essentially returning the situation to where it was before Law 500.

Gypsum and Salt.—The Industrial Development Corporation was the sole producer of gypsum and rock salt from the great Barahona deposits, and of sea salt from salinas at Puerto Hermosa on Las Calderas Bay. Production in 1964 has not been reported but is believed to have been greatly diminished unless new foreign customers were found to replace the 1963 loss of sales to the United States. An estimated 13,500 tons of gypsum was required for the production of cement, and the domestic consumption of salt has been only slightly more than 1,000 tons annually.

Mineral Fuels.—*Petroleum.*—On March 30, 1964, the Government signed a petroleum exploration contract with the Quisqueya Oil Company, a Dominican-Cuban firm. Wildcat drilling was started for a 4,000-foot well about 14 kilometers (9 miles) southeast of La Vega, and for a 5,000-foot well about 4 kilometers (2.5 miles) from Bani on the south coast. The Dominican Republic has not produced any oil or gas commercially since 1941, and this is the first wildcatting since 1961.

In midyear a 15,000-barrel-per-day petroleum refinery concession was awarded Midlands Cooperatives, Inc., of Minneapolis, Minn. On August 24 a new company, Dominican Refinery for Cooperatives (REFIDOM—Refinería Dominicana Pro Cooperativas, C. por A.), was formed to install and operate the refinery to be constructed near the present terminal facilities of the major oil companies, near Santo Domingo. Under the terms of the concession, the capital stock of REFIDOM is held in equal amounts by the Midlands group and the Dominican Cooperative Credit and Development Institute, with the latter partner having the right to acquire eventually a majority interest in the company. The refinery is to be designed to produce—probably from imported Venezuelan crude—gasoline and jet fuel, LPG, kerosine, diesel and bunker C fuel oil, and asphalt.

HAITI[5]

Haiti was of world mineral significance in 1964 only in the production of bauxite and copper, and in these only to a minor extent. It was fifth-ranked among the six bauxite producing areas of Latin America. It did not rival the great Latin American copper production of Chile, Peru, or Mexico, but its copper output exceeded that of Bolivia, Brazil, and Ecuador among the smaller copper-producing countries of Latin America, ranking second only to Nicaragua in this group.

Domestically the value of output of bauxite, copper, gold, silver, and cement in 1964 (about $8.5 million) is believed to have comprised approximately the same 2.3 percent[6] of the gross national product (GNP) that it did in 1963. This assumption is made without definite information on the 1964 GNP, or total productive value of the mineral industry for any year in the absence of data on lime and salt, which are produced in sufficient quantity to meet virtually all domestic requirements.

Although Haiti remained entirely dependent on imports for its metal and mineral manufactures (excluding cement) and mineral fuels, its expenditures for these products were more than balanced by its receipts from mineral raw materials sold abroad, which contributed substantially to a favorable total balance of trade as shown below for fiscal years ending September 30:

	Value (thousand dollars)		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Trade balance:			
1961–62	+2,908	+3,661	XX
1962–63	+3,300	+7,198	XX
Exports:			
1961–62	6,905	40,832	16.9
1962–63	7,478	43,212	17.3
Imports:			
1961–62	3,997	37,171	10.8
1962–63	4,178	36,014	11.6

XX Not applicable.

GOVERNMENT POLICIES AND PROGRAMS

The policy of the Haitian Government in respect to its generally stagnant economy can best be described as opportunistic. Serious and moderately successful efforts have been made to attract foreign investments in business and industrial developments, but the terms or duration of contractual agreements have not been considered necessarily binding if at any time the Government regards a change to be advantageous to its interests. For example, a contract for the Government's only mineral industry project of 1964, a petroleum refinery construction job carried over from 1963, was canceled with the original contractor and was reassigned to other interests. By yearend, no serious work had been started. (For details see Mineral Fuels under Commodity Review.)

---

[5] Prepared by Sumner M. Anderson, chief Latin America specialist, Division of International Activities.

[6] Erroneously reported as 23 percent in the 1963 Minerals Yearbook, Volume IV.

In June 1963 a new commercial treaty, effective October 31, was signed between Japan and Haiti, putting an end to a 100 percent surtax on Japanese exports to Haiti which apparently had been in effect for more than 10 years. In January 1964 a four-man Japanese trade mission visited Haiti to explore the possibilities of increasing Japanese exports to Haiti. Most-favored-nation treatment continued to be accorded to the United States and other members of GATT (General Agreement on Tariffs and Trade), and Haiti maintained a bilateral agreement with France. Chief objectives of the current Haitian foreign trade policy include increased trade with and aid from European Common Market countries and the Eastern European nations.

PRODUCTION

Overall mineral production has apparently increased steadily but at a diminishing upward rate since 1959; however, precise, detailed, and comprehensive analysis is difficult because the Haitian Government has published no definitive statistics on mineral production. Bauxite production statistics were calculated from data supplied to the U.S. Embassy, Port-au-Prince, by Reynolds Haitian Mines, Inc. The products of copper mining, adjusted to metric tons, are from operational data on the holdings of Consolidated Halliwell, Ltd., published annually in the Canadian Mines Handbook. Cement production figures and the estimated annual rate of lime and salt production were supplied by the U.S. Embassy, Port-au-Prince. Limestone production was roughly approximated on the basis of assumed requirements of 1.3 tons of limestone per ton of cement, and 1.786 tons of limestone per ton of lime.

TABLE 8.—Haiti: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum ore: Bauxite, dry equivalent	[r] 272,100	266,800	376,300	332,500	378,600
Products of copper mining:					
Ore milled	56,514	165,146	255,825	254,478	241,189
Concentrates produced	[r] 3,400	10,658	[r] 15,422	16,181	12,655
Content of concentrates:					
Copper	[r] 987	[r] 2,861	[r] 4,280	[r] 5,884	5,029
Gold troy ounces	1,385	4,341	7,149	6,778	8,090
Silver do	19,596	61,424	94,761	107,022	92,057
Nonmetals:					
Cement	48,051	44,435	51,352	45,798	55,704
Lime [e]	180,000	180,000	180,000	180,000	180,000
Limestone [e]	384,000	379,000	389,000	393,000	394,000
Salt, marine [e]	10,400	10,400	10,400	10,400	10,400

[e] Estimate. [r] Revised.

TRADE

In descending order of value, the principal items of export from Haiti in the fiscal year 1961–62 were coffee, bauxite, copper concentrates, sisal, and sugar; in 1962–63 the order changed to coffee, sugar, bauxite, sisal, and copper concentrates. The established markets for bauxite and copper have been the United States and Japan, respectively, with a minor shipment of copper concentrates to Portugal in 1961–62. By virtue of Haitian requirements for petroleum refinery products, Curaçao, Trinidad, and the United States, in that order, have been the leading sources of mineral imports.

In terms of total value of foreign trade in all products, the United States has been the principal purchaser of Haitian exports and supplier of Haitian imports for many years.

TABLE 9.—Haiti: Exports of metals and minerals [1]

(Metric tons)

Commodity	1961–62	1962–63	Destinations, 1962–63
Metals:			
Aluminum ore, bauxite	451,329	519,395	All to United States.
Copper concentrate	18,398	12,377	All to Japan.

[1] Fiscal year, ending Sept. 30.

Source: Rapport Annuel de l'Administration Generale des Douanes, Haiti.

TABLE 10.—Haiti: Imports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1961–62	1962–63	Principal sources, 1962–63 [2]
Metals:			
Aluminum, including alloys:			
Unwrought	(3)	25	United States 14; Italy 10; Bahamas 1.
Semimanufactures	28	83	Italy 56; Switzerland 12; Austria 8.
Copper, including alloys:			
Unwrought	5	10	United States 7; Belgium 3.
Semimanufactures	98	12	United States 6; Germany 4; United Kingdom 1.
Iron and steel:			
Iron ores and concentrates		1	Mainly from Germany.
Scrap iron and steel		1	Mainly from Bahamas.
Pig iron, sponge iron, ferroalloys, iron and steel powders.	(3)	13	Belgium 10; France 2; United States 1.
Ingots and other primary forms		18	United Kingdom 9; Belgium 5; Germany 3.
Semimanufactures	5,228	6,510	Belgium 2,861; France 1,534; United States 911.
Lead, including alloys, all forms	2	1	Mainly from Belgium.
Nickel, including alloys, semimanufactures.	4		
Platinum and platinum group metals, unworked or partly worked. troy ounces		2,058	United States 1,833; Canal Zone 193; United Kingdom 32.
Silver, unworked or partly worked. troy ounces	19,996	129	United States 65; Switzerland 64.
Tin, including alloys:			
Unwrought long tons	(3)	2	Mainly from United States.
Semimanufactures do	124	82	United States 80; Japan 2.
Zinc, including alloys, semimanufactures.	(3)	(3)	All from Belgium.
Nonferrous metals, ores, and concentrates, not specified.	(3)	(3)	All from United States.

See footnotes at end of table.

TABLE 10.—Haiti: Imports of metals and minerals[1]—Continued
(Metric tons unless otherwise specified)

Commodity	1961–62	1962–63	Principal sources, 1962–63 [2]
Nonmetals:			
Abrasives, natural, including industrial diamond . . . kilograms	----------	60	All from United States.
Asbestos-cement building materials	237	242	Belgium 223; United States 10; France 9.
Cements, not further specified	413	516	United Kingdom 163; United States 127; Denmark 89.
Chalk	2	3	All from United States.
Clay and similar refractory materials	68	36	Germany 26; United States 10.
Clay products, nonrefractory	82	125	United States 30; Italy 19; Czechoslovakia 18; Japan 18; United Kingdom 18.
Fertilizer materials:			
Nitrogenous	----------	157	United States 142; Germany 15.
Phosphatic	----------	10	Mainly from Germany.
Potassic	81	837	United States 807; Germany 30.
Mixed and nonspecified fertilizers	57	----------	
Gem stones . . . kilograms	21	[4] 56	Mainly from United Kingdom.
Graphite . . . do	----------	282	All from United States.
Mica, worked . . . do	113	1,625	All from United States.
Refractory bricks and similar products	86	63	United States 37; Austria 26.
Salt	56	58	United States 54; France 3; Canada 1.
Sand, including ground quartz	----------	2	Mainly from United States.
Sodium carbonate (soda ash)	56	39	United Kingdom 23; United States 16.
Sodium hydroxide (caustic soda)	243	----------	
Stone:			
Dimension, worked or not	36	36	United States 34; Italy 2.
Industrial, not specified	9	----------	
Sulfur	----------	3	Mainly from United States.
Other, not specified	38	93	United States 90; Germany 2; Netherlands 1.
Mineral fuels:			
Coal	(3)	28	United States 18; Germany 10.
Asphalt, natural	----------	730	United States 432; Trinidad and Tobago 270; Germany 17.
Mineral tar and crude chemicals from coal, petroleum and natural gas.	150	166	United States 143; Netherlands Antilles 21; United Kingdom 2.
Petroleum refinery products:			
Gasoline . . . 42-gallon barrels	282,428	252,186	Trinidad and Tobago 125,472; United States 88,992; Netherlands Antilles 37,692.
Kerosine . . . do	22,435	25,670	Netherlands Antilles 14,332; Trinidad and Tobago 6,464; United States 4,799.
Fuel oils [5]	24,304	28,269	Trinidad and Tobago 12,752; United States 8,221; Netherlands Antilles 6,887.
Lubricants	1,106	1,547	United States 1,298; Netherlands Antilles 124; United Kingdom 62.
Paraffin and vaseline	206	207	Germany 92; United States 59; Netherlands 47.
Other [6]	583	28	Mainly from United States.

---

[1] Fiscal year, ending Sept. 30.

[2] Haitian trade returns do not differentiate East and West Germany.

[3] Less than ½ unit.

[4] Excludes a reported 5,102 kilograms from the United States, valued at G4,554. Reported unit of quantity (kilograms) is questionable, and may be grams.

[5] As reported. Other sources indicate data may be incomplete.

[6] May include some products derived from coal and natural gas.

Source: Rapport Annuel de l'Administration Generale des Douanes, Haiti.

COMMODITY REVIEW

Metals.—*Bauxite.*—Production of bauxite by the only company operating in Haiti, Reynolds Haitian Mines, Inc., has increased and decreased in alternate years since its beginning in 1957, but the trend has been upward with the peak thus far attained in 1964. If the pattern continues, the 1964 record will not be surpassed until 1966. The bauxite, mined at Saint Croix and dried to an average 13.4 percent moisture, was shipped from the port of Miragoâne, as customary, to the Corpus Christi, Tex., refining plant of the parent Reynolds Metals Co.

In midyear some interest was shown by the Olin-Mathieson Co. in the possible development of bauxite deposits in northern Haiti, involving the opening of a new mine, completion of partly finished hydroelectric power facilities, and construction of an alumina plant. No concrete results of this interest were evident by yearend.

Copper.—Société d'Exploitation et de Développement Economique et Naturel d'Haiti (SEDREN, S.A.) was the only other company mining metallic ores in Haiti in 1964. The 1964 decline in production has been attributed to serious depletion of high-grade ore (2.5 percent copper). The original reserve estimate of Consolidated Halliwell, Ltd., of Toronto, the parent company, was 1.8 million short tons, equivalent to 1.6 million metric tons. From the beginning of operations in 1960 to the end of 1964, an indicated 973,152 metric tons of high-grade ore was milled which, if original estimates were reliable, should leave a reserve of approximately 600,000 tons of high-grade ore in the Mene ore body, enough to support the 1964 scale of operations for less than 3 more years. This is exclusive of consideration of the local economic feasibility of exploiting an estimated 5.2 million short tons (4.7 million metric tons) of 1.7 percent copper ore in the same Terre Neuve district, Department of L'Artibonite. Exploration for more high-grade ore continued throughout the year. Concentrates sold to Minerals and Chemicals Philipp Corp. were shipped by that purchaser from the port of Gonaïves to Japan. They contained 39.7 percent copper, 13.74 troy ounces of silver, and 0.64 ounce of gold per metric ton.

Gold and Silver.—There was no recorded placer mining for precious metals in Haiti. Total production was of gold and silver contained in copper concentrates produced by SEDREN, S.A.

Nonmetals.—*Cement.*—Le Ciment d'Haiti, the only cement company in Haiti, gauged its production to meet the slightly increased domestic demand in 1964, and imports of cement were only nominal. The manufacture of concrete blocks and other cast forms for construction was conducted by other companies and not by Le Ciment d'Haiti as erroneously reported in the 1963 edition of Minerals Yearbook, Volume IV.

Lime.—The burning of lime remained a widely scattered, primitive, backyard industry for which statistics have not been collected. Production is estimated to have been at the rate of 120,000 cubic meters annually, roughly equivalent to 180,000 tons.

Salt.—Recovery of salt by solar evaporation of sea water was also a primitive, diverse, and irregular occupation for which records have not been compiled. The rate of annual output for local use exclusively has been estimated at 23 million pounds, or approximately 10,400 tons.

Mineral Fuels.—*Petroleum.*—Haiti produced no petroleum, and no exploration for petroleum was conducted in 1964. The Government has hoped to decrease its dependence on imported petroleum products by encouraging establishment of a domestic refinery. Toward this end it entered a contract in February 1963 with the Valentine Petroleum & Chemical Corp. for the construction and operation of a petroleum refinery in the Port-au-Prince area. On October 29, 1964, the Government published a decree cancelling the contract in favor of similar but much broader concessions, including establishment of a petrochemical plant and full control of all phases of the petroleum industry, to one Egyptian-born Sheikh Mohamed Fayed who promptly became a naturalized citizen of Haiti.[7] The rights granted by these concessions were not seriously exercised during the year.

Consumption of refined petroleum products in Haiti has been reported as follows, in 42-gallon barrels:

Products	1961	1962	1963	1964
Aviation gasoline	31,000	17,000	9,000	10,186
Motor oil	258,000	275,000	235,000	227,453
Distillate fuel oil	273,000	314,000	296,000	364,448
Residual fuel oil	143,000	153,000	156,000	195,067
Lubricants	12,000	11,000	16,000	19,270
Other	3,000	2,000	5,000	12,384
Total	720,000	772,000	717,000	828,808

JAMAICA[8]

Jamaica's mineral industry output was again confined to relatively few products. In production of bauxite however, the country was the leading world producer by a large margin. The 1964 record bauxite output of approximately 8 million dry metric tons was almost twice that of Surinam, the non-Communist world's second-ranked producer. Value of Jamaica's 1964 bauxite production was estimated at $67.5 million[9] and was about 95 percent of the $71.4 million total value of Jamaican mineral production. Total mineral output value increased by $12 million over the 1963 figure of $59.4 million. The value of bauxite mined in 1964 was equivalent to about 9 percent of the island's gross national product of $769.2 million ($711.2 million in 1963).

Estimated capital expenditure by the bauxite companies was $10.4 million in 1963 and $5.5 million in 1964. The abnormally high expenditure in 1963 resulted from new investment by Alcoa Minerals of Jamaica, Inc. Employment in the mineral industry was approximately 5,000 in 1964 compared with 6,000 in 1963. The decrease resulted from the completion of various construction projects, chiefly that of Alcoa's facilities. Other minerals produced on the island in 1964 were various types of clays, gypsum, limestone, sand, gravel, and other construction materials. Of these gypsum had the largest value in terms of export earnings.

Bauxite and alumina remained Jamaica's dominant mineral exports, accounting for $44.0 million and $51.0 million, respectively, of the value of total domestic product exports of about $212.2 million in 1964. Mineral commodity imports in 1964, which accounted for $25 million of the total import value of $282 million, were largely crude oil to feed the new Kingston refinery, a significant change with respect to the 1963 pattern when petroleum refinery products were the dominant import.

---

[7] Sheikh Mohamed Fayed subsequently disappeared from the local scene, and on February 4, 1965, a new decree transferred his concessions to the Banque Commerciale d'Haiti.

[8] Prepared by Benjamin H. Lim, physical scientist, Division of International Activities.

[9] Where necessary, values have been converted from Jamaican pounds (J£) to U.S. dollars at the rate of J£1 equals US$2.80.

GOVERNMENT POLICIES AND PROGRAMS

Jamaica's 5-Year Independence Plan, the first national economic plan in the island, was in its second year of operation in 1964. The plan projected a gross domestic product growth rate averaging 5 percent per year over the 5-year period, 1963–67. Preliminary results indicated an actual increase in the gross domestic product for the first 2 years of the plan of approximately 10 percent in terms of 1963 constant prices, with most of the economic growth taking place in 1964.

The fundamental aim of the plan is to achieve a balance between economic growth and social development. The plan involves a total expenditure of approximately $256 million for the 5-year period, and is based on Jamaica's bauxite deposits and the island's particular economic and social problems. In general, the plan outlines the Government's economic policies in relation to development in various sectors. It also proposes certain specific projects with which to construct a firm economic infrastructure in the island and to implement the plan's broad and long-range economic and social objectives. Some of the proposed projects include the development of new and the expansion of existing natural resources, the construction of roads and housing facilities, and the establishment of a number of industries to supply the demands of the domestic consumers. The plan also provides for periodic examination of the structure and conditions of the private sector of the economy. Data from such examinations will be used to formulate performance guidelines and new proposals for each of the individual sectors of the economy.[10]

In the first quarter of 1964, the United States and Jamaica signed an agreement under which the former was to purchase on barter through the Commodity Credit Corp. 813,000 metric tons of bauxite for stockpiling purposes. Alcoa Minerals (Jamaica) Ltd., Kaiser Bauxite Co., and Reynolds Jamaica Mines Ltd. had equal shares of the total, approximately 271,000 metric tons each. A large part of the contracted amount was delivered in 1964.

PRODUCTION

The outstanding change in Jamaica's mineral industry in 1964 was the completion of Esso West Indies Ltd. refinery in Kingston. The plant was put on the production stream in March of 1964. Heretofore, Jamaica had to import all of its petroleum requirements in the form of refinery products, chiefly from the United States and nearby Latin American countries. Crude for the new refinery is currently imported chiefly from Venezuela. Output of the refinery is expected to be more than sufficient to supply all of the island's domestic demand. The remainder is for exports, mostly to other Caribbean islands.

Also of note was the increased output of bauxite in 1964 to almost 8 million tons, or 13 percent above the 1963 output. Production of alumina in 1964 was about 6 percent above the preceding year's level.

Construction activity on the island, reported to be 30 percent greater in 1964 than in 1963, prompted sharp increases in output of all types of construction minerals during 1964. Limestone production, for example, was nearly three times the 1962 level, the last year for which a figure was reported. Gravel output, unrecorded prior to 1964, approached the three-quarter million ton mark; and sand production, also unrecorded prior to 1964, was more than one-quarter of a million tons. Significant increases also were noted in production of marble, dimension stone, and clays. Gypsum production, however, was about 20 percent below the 1963 output, apparently because of the sluggishness of world prices for the mineral.

---

[10] The Central Planning Unit, Government of Jamaica. Economic Survey: Jamaica 1963. April 1964, 79 pp.

TABLE 11.—Jamaica: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals: Aluminum:					
Bauxite, dry equivalent:[1]					
Produced for export	4,214,123	5,054,648	6,084,796	5,244,391	[2] 6,062,984
Converted to alumina	1,622,871	1,715,415	1,530,623	1,769,519	1,873,574
Total	5,836,994	6,770,063	7,615,419	7,013,910	7,936,558
Alumina (exports)	676,040	714,774	637,719	737,193	780,656
Nonmetals:					
Cement, common portland	212,175	215,710	200,162	200,721	281,339
Clays, for cement	NA	NA	NA	NA	55,221
Gypsum	249,778	226,625	228,923	231,968	195,212
Limestone	NA	NA	[3] 1,708,000	NA	4,300,656
Marble, cut and/or polished	NA	NA	NA	NA	136,623
Phosphates	65	63	57	14	----------
Sand and gravel:					
Common sand	NA	NA	NA	NA	[e] 273,000
Glass sand	NA	NA	6,648	[r] 5,011	10,474
Gravel, natural	NA	NA	NA	NA	668,400
Mineral fuels: Petroleum refinery products:					
Gasoline..thousand 42-gallon barrels	----------	----------	----------	----------	1,033
Kerosine.....do	----------	----------	----------	----------	528
Distillate fuel oil.....do	----------	----------	----------	----------	1,023
Residual fuel oil.....do	----------	----------	----------	----------	3,852
Liquefied petroleum gases.....do	----------	----------	----------	----------	55
Asphalt	----------	----------	----------	----------	24

[e] Estimate. [r] Revised. NA Not available.
[1] Data have been adjusted to exclude all free moisture.
[2] May include dry equivalent of 24,144 tons of bauxite produced specifically for cement manufacture.
[3] Based on offical estimated production of registered quarries.

TRADE

There was a substantial increase in Jamaica's overall foreign trade in 1964 compared with that of 1963. Value of 1964 imports increased 25 percent above the preceding year's level, and the export value was up 8 percent. Alumina and bauxite, the island's chief exports in 1963 and 1964, were valued at approximately $82.3 million and $94.9 million, respectively. Those values were 42 and 45 percent, respectively, of the country's total domestically produced exports, valued at $196.6 million in 1963 and $212.2 million in 1964. Of the 1964 aluminum industry total of $94.9 million worth of bauxite and alumina, bauxite exports accounted for 46.3 percent and alumina exports for 53.7 percent.

Total imports, consisting chiefly of consumer manufactured commodities, capital goods, and foodstuffs amounted to $225.7 million and $282 million in 1963 and 1964, respectively.

Of the total imports, mineral commodity imports in 1964 were valued at $25 million (largely crude oil from Venezuela) compared with $23.8 million in 1963 (largely petroleum refinery products). The second most significant category of mineral product-based imports were fertilizers, valued at $5.5 million in 1964 and $3.4 million in 1963. The sizable increase in fertilizer imports from that of the preceding year reflected the Jamaican Government's efforts to reduce the island's food imports by raising indigenous production.

The substantial increase of imports with respect to exports in 1964 resulted in a trade deficit of approximately $70 million for the year, far in excess of the $41.4 million deficit recorded in 1962 and the $29.1 million in 1963. In an effort to stem the trade deficit and to bring the island's foreign trade into a more favorable balance, the Jamaican Government recently instituted a new series of foreign trade measures.[11]

The United States, United Kingdom, and Canada remained Jamaica's principal trading partners, together accounting for 88 percent of Jamaica's imports and 67 percent of Jamaica's exports in 1963 and 1964. Since 1963 the United States has ranked ahead of the United Kingdom as Jamaica's leading trade partner and it was the only one of the three above countries to enjoy a small favorable trade balance of $3.0 million in 1963 out of a total of $68.2 million worth of exports to Jamaica in return for $65.1 million worth of imports from the island, mainly bauxite. In 1964, Jamaica's trade deficit with the United States rose to $9.5 million as a result of $87.1 million of imports against $77.6 million of exports. Imports from the United States consisted mainly of foodstuffs, textile yarns and fabrics, machinery, and transport equipment.[12]

TABLE 12.—Jamaica: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Domestic products:			
Aluminum:			
Bauxite	6,082,764	5,244,411	All to United States.
Alumina	637,719	737,259	Canada 478,127; Norway 180,457; Sweden 37,543.
Metal and alloys, semimanufactures.	19	1	All to British Honduras.
Iron and steel:			
Scrap	1,070	5,129	Japan 5,080; West Germany 39; Netherlands 7.
Semimanufactures	6	----------	
Nonferrous metal scrap	1,030	1,869	West Germany 934; Japan 555; United Kingdom 176.
Reexports:			
Copper sulfate	----------	51	All to United States.
Iron and steel:			
Ingots and equivalent forms	6	(1)	All to Cayman Islands and Turks and Caicos Islands.
Semimanufactures	71	1,265	United States 1,032; Surinam 166; Trinidad and Tobago 42.
Nonferrous metals:			
Unwrought	1	29	Denmark 18; United Kingdom 9; West Germany 1.
Semimanufactures	44	76	West Germany 30; Turks and Caicos Islands 28; United States 10.

See footnotes at end of table.

---

[11] Haidar, W. Foreign Trade Regulations of Jamaica. Overseas Business Reports, OBR 65–15, Bureau of International Commerce, U.S. Department of Commerce, Washington, D.C. March 1965, 8 pp.

[12] The Central Planning Unit, Government of Jamaica. Economic Survey: Jamaica 1964. April 1965, 119 pp.

TABLE 12.—Jamaica: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Nonmetals:			
Domestic products:			
Cement, portland	21,878	38,035	Bahamas 16,369; Bermuda 6,096; British Honduras 3,768.
Clay and clay products:			
Clay, not further specified	2	1	All to United Kingdom.
Brick and tile	235	75	United States 41; Cayman Islands 33; St. Vincent 1.
Fertilizer materials, not further specified.	----------	8	Haiti 5; Trinidad and Tobago 3.
Gypsum	260,907	136,651	All to United States.
Mica:			
Sheet, block, scrap, or ground kilograms	----------	5,446	Puerto Rico 2,906; United States 2,540.
Manufactures do	8,707	7,671	Puerto Rico 4,768; United States 2,903.
Sand, gravel, crushed rock	6,096	8,977	Cuba 8,972; Cayman Islands 4; United States 1.
Sodium carbonate (soda ash)	----------	7	All to Trinidad and Tobago.
Stone, dimesion	48	85	Mainly to United States.
Other, not specified	[r]25	1	All to Dominica.
Reexports:			
Fertilizer materials	15	16	All to United States.
Salt	40	27	Cayman Islands 25; British Guiana 2.
Other, not elsewhere specified [2]	12	21	Haiti 8; Cayman Islands 6; Turks and Caicos Islands 6.
Mineral fuels:			
Reexports, including bunkers:			
Coal and coke	2	4	All to Turks and Caicos Islands.
Gases, liquefied [3]	5	21	Cayman Islands 20; bunkers 1.
Petroleum refinery products: [4]			
Gasoline:			
Aviation 42-gallon barrels	121,540	72,267	Bunkers 69,384; Netherlands Antilles 2,843; Turks and Caicos Islands 32.
Other do	2,797	3,904	Cayman Islands 2,082; Turks and Caicos Islands 1,270; New Zealand 526.
Kerosine do	282,664	410,838	Bunkers 395,678; United States 7,591; United Kingdom 3,608.
Distillate fuel oil [5] do	283,954	234,813	Bunkers 232,751; Turks and Caicos Islands 1,152; Cayman Islands 910.
Residual fuel oil [5] do	601,183	17,954	Bunkers 15,632; United States 1,530; British Honduras 569.
Lubricants [5] do	1,427	3,506	Bunkers 1,445; Cayman Islands 1,420; Dominican Republic 263.
Paraffin and vaseline [5] do	2	2	Mainly to Turks and Caicos Islands.
Lighter fuel do	----------	26	All to Cayman Islands.
Asphalt	22	1	All to Cayman Islands.

[r] Revised.
[1] Less than ½ unit.
[2] Mainly caustic soda and miscellaneous building materials.
[3] Includes natural gas and gases derived from coal and petroleum
[4] Excludes liquefied petroleum gas (LPG).
[5] Source reports quantities in gravimetric units. Conversion to volumetric units is based on conversion factors in use by U.S. Bureau of Mines.

Source: Jamaica Department of Statistics. External Trade of Jamaica.

TABLE 13.—Jamaica: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Alumina	10	13	All from France.
Metal, including alloys, all forms	1,140	1,249	United Kingdom 694; United States 312; Canada 122.
Copper:			
Sulfate, kilograms	2,021	278	United States 272; United Kingdom 6.
Metal, including alloys, all forms	167	156	United Kingdom 116; Canada 21; United States 18.
Gold, nonmonetary, value	J£24,053	J£25,596	NA.
Iron and steel:			
Scrap iron and steel		508	Mainly from British Guiana.
Pig and sponge iron	77	213	United Kingdom 187; Canada 26.
Ingots and equivalent primary forms	468	113	United Kingdom 71; United States 42.
Semimanufactures, including castings and forgings.	45,073	49,426	United Kingdom 16,395; Belgium-Luxembourg 10,311; United States 5,022.
Lead, including alloys:			
Unwrought	113	156	United Kingdom 114; Mexico 40; United States 2.
Semimanufactures	69	77	United Kingdom 76; Denmark 1.
Nickel, including alloys, all forms, kilograms	10,719	2,286	United States 1,168; Canada 813; United Kingdom 305.
Platinum and platinum-group metals, unworked and partly worked, value	J£630	J£324	United States J£180; United Kingdom J£144.
Silver, unworked and partly worked, do	J£558	J£473	United Kingdom J£432; United States J£41.
Tin, including alloys and solder:			
Unwrought, long tons	36	35	Mainly from United Kingdom.
Sheets, do	[1] 623	(2)	All from Canada.
Other semimanufactures, do	430	5	Mainly from United Kingdom.
Zinc, including alloys, all forms	41	124	United Kingdom 111; Japan 8; United States 4.
Other [3], value	J£6,625	J£2,334	United Kingdom J£1,825; United States J£509.
Nonmetals:			
Abrasives, natural, including industrial diamond.	10	5	United Kingdom 2; Canada 1; Italy 1.
Asbestos:			
Crude fiber	21	115	Mainly from United Kingdom.
Building materials	2,506	1,111	Italy 563; United Kingdom 357; Belgium-Luxembourg 147.
Cement:			
Portland	1,087	1,253	United Kingdom 734; Denmark 444; Japan 75.
Refractory	129	191	United Kingdom 156; United States 21; Canada 14.
Other	25	23	United Kingdom 19; United States 3; West Germany 1.
Clay and clay products:			
Clay, not further specified	1,352	1,413	United Kingdom 1,249; United States 164.
Brick, tile, pipe, and similar products	686	744	United Kingdom 523; United States 179, Netherlands 17.
Gem stones, including diamonds:			
Uncut, value		J£275	Canada J£265; United Kingdom J£10.
Cut, but unset, do	J£1,496	J£2,104	British Guiana J£1,178; Canada J£307; United Kingdom J£191.
Fertilizers, mineral and chemical:			
Nitrogenous:			
Ammonium sulfate	22,883	25,773	Trinidad and Tobago 22,001; Belgium-Luxembourg 1,975; Italy 914.
Other	1,117	3,371	West Germany 1,090; Netherlands 1,012; Trinidad and Tobago 709.
Phosphatic:			
Natural phosphates	6		
Superphosphates, Thomas slag, other manufactured phosphates.	1,587	2,108	Netherlands 1,216; United States 361; Belgium-Luxembourg 266.
Potassic:			
Potash salts	787	6,528	France 3,224; West Germany 3,213; United Kingdom 51.
Other, not specified	3,660	5	Mainly from West Germany.
Mixed and other nonspecified fertilizers	21,151	19,291	Netherlands 10,032; Italy 8,087; West Germany 930.

See footnotes at end of table.

TABLE 13.—Jamaica: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals—Continued			
Graphite, natural .... kilograms..	1,214	1,839	All from United Kingdom.
Gypsum, limestone, other industrial stone...	416	358	United Kingdom 346; United States 7; France 4.
Mica:			
Sheet, block, scrap, or ground........	85	65	Norway 56; Brazil 5; India 2; United States 2.
Manufactures........ kilograms..	67	382	West Germany 290; United States 51; United Kingdom 41.
Refractory brick and similar products......	3,050	4,302	United States 3,284; United Kingdom 698; Austria 180.
Salt........	11,115	11,626	Turks and Caicos Islands 3,732; United Kingdom 2,678; Canada 2,079.
Sand, gravel, crushed rock........	488	951	Belgium-Luxembourg 708; United States 203; United Kingdom 20.
Sodium carbonate (soda ash)........	1,960	1,354	United States 1,043; United Kingdom 293; Canada 18.
Sodium hydroxide (caustic soda)........	38,941	42,948	United States 42,565; United Kingdom 372; Canada 5.
Stone, dimension........	430	290	Italy 185; United States 80; Belgium-Luxembourg 15.
Sulfur........	16	1,120	United States 814; Mexico 304; United Kingdom 2.
Other, not specified or not elsewhere specified.	1,096	452	United Kingdom 204; Italy 176; United States 38.
Mineral fuels:			
Coal........	211	161	United Kingdom 156; United States 5.
Coal briquets........	10	16	Mainly from United Kingdom.
Coal coke........	514	668	West Germany 419; United Kingdom 245; United States 4.
Gases, liquefied [4]........	4,559	5,809	Venezuela 5,434; France 161; Trinidad and Tobago 101.
Petroleum refinery products:			
Gasoline:			
Aviation. thousand 42-gallon barrels..	113	136	Trinidad and Tobago 125; Netherlands Antilles 8; United States 3.
Other........ do....	743	733	Mainly from Trinidad and Tobago.
Kerosine........ do....	581	599	Trinidad and Tobago 312; Netherlands Antilles 287.
Distillate fuel oil [5]........ do....	1,084	1,009	Netherlands Antilles 532; Trinidad and Tobago 343; United States 94.
Residual fuel oil [5]........ do....	3,370	3,518	Netherlands Antilles 2,164; Venezuela 870; United States 484.
Lubricants [5]........ do....	44	40	United States 24; Netherlands Antilles 9; United Kingdom 7.
Paraffin and vaseline.[5] 42-gallon barrels..	2,174	2,687	United States 1,149; Netherlands 1,027; West Germany 341.
Lighter fuel........ do....	79	77	United Kingdom 58; United States 19.
Petroleum coke........	....	30	All from West Germany.
Asphalt [6]........	9,254	8,582	Netherlands Antilles 2,702; Venezuela 2,702; Trinidad and Tobago 1,969.
Natural asphalt........	2,386	3,869	All from Trinidad and Tobago.
Mineral tar and crude chemicals from coal, petroleum, and natural gas.	113	135	United States 80; United Kingdom 38; Canada 17.

NA Not available.

[1] Quantity shown probably includes paperbacked foils and therefore does not represent actual amount of metal involved.

[2] Less than ½ unit.

[3] Miscellaneous metals and metalliferous ores and concentrates, not specified or not elsewhere specified.

[4] Includes natural gas and gases derived from coal and petroleum.

[5] Source reports quantities in gravimetric units. Conversion to volumetric units based on conversion factors in use by U.S. Bureau of Mines.

[6] May include relatively small amounts of other petroleum or coal byproducts.

Source: Jamaica Department of Statistics. External Trade of Jamaica.

COMMODITY REVIEW

Metals.—*Aluminum and Bauxite.*—Jamaica's 1964 output of bauxite reached a new high of about 8 million dry metric tons, approximately 13 percent above the 1963 level. The significant increase in output resulted in part from the operations of Jamaica's fourth and newest bauxite mining company, Alcoa Minerals of Jamaica, Inc., which had a full year's production in 1964. Exports of bauxite, all to the United States, totaled approximately 6 million tons in 1964 compared with 5 million tons in 1963.

Alumina exports in 1964 totaled approximately 781,000 tons, 44,000 tons above the 1963 level. All of the island's alumina was produced by Alcan Jamaica Ltd. Of the total exports of this commodity in 1964, shipments to Canada were valued at $31.6 million, while sales to Norway totaled $10.9 million. Other countries to which alumina was exported during 1964 included the United States, Sweden, Hungary, Switzerland, and West Germany.

Government revenue in form of income taxes and royalties from the industry in 1964 totaled $18.5 million, exceeding the 1963 figure by $2.8 million.

All four operating aluminum companies in Jamaica (Reynolds, Alcan, Kaiser, and Alcoa) continued to employ open pit mining methods in their bauxite deposits. Individual methods employed by the firms varied only slightly. For example, Reynolds used shovels and draglines; Alcan, which supplied ores to feed the firm's two alumina plants on the island, employed draglines and scrapers, while Kaiser and Alcoa both used draglines.[13]

Programs to reclaim mined-out land were continued. In general, the practice has been to strip off and stockpile the topsoil, remove the bauxite ore, and then fill in the pit, rendering the land suitable for grazing or other agricultural purposes.[14]

Plant modifications were started in 1964 on the Ewarton and Kirkvine alumina plants of Alcan Jamaica Ltd., a subsidiary of Aluminium Ltd. of Canada. The alumina capacity of the Kirkvine works was expanded to 789,000 tons per year by the end of 1964. The company also has planned to expand the alumina production at its Ewarton works by some 37,000 tons per year. Construction of additional facilities was to be started in early 1965, and completion was scheduled for the first quarter of 1966. The expansion at Ewarton, estimated to cost about $1.8 million, was to raise the plant's alumina production to 315,000 tons a year and total company annual capacity to 826,000 tons.

Alcoa Minerals of Jamaica, Inc., the fourth and newest bauxite mining company on the island, shipped 526,358 dry metric tons of bauxite in 1964 compared with 92,929 tons in November and December 1963. This new $16.5 million integrated mine-kiln-port complex is scheduled to expand production capacity to 1 million tons per year when all facilities are completed. Alcoa's ore is transported by means of 30-ton trucks from the mines to Woodside, where the loads are transferred to aluminum-body rail cars. The loaded rail cars are then hauled on a 18.5-mile railroad to the port at Rocky Point, where the ore is dried, stored in a huge aluminum dome, and later loaded on freighters. All material handling functions at Rocky Point are performed by highly automated facilities. The entire output thus far has been shipped to Point Comfort, Tex., for further processing. Typical analysis of Alcoa's bauxite shipments during 1964 averaged 48 per cent Al_2O_3, 1.98 percent SiO_2, and 15 percent moisture. Moisture content of mine run ore, however, averaged 19 percent.

---

[13] Elgo, M. Jamaica—Planning for Versatile Mining. Eng. and Min. J., v. 165, No. 3, March 1964. pp. 78–79.

[14] Elgo, D. P. Bauxite Companies Build a Better Jamaica. Eng. and Min. J., v. 165, No. 12, December 1964, pp. 102–103.

Kaiser Bauxite Co. continued its expansion project in 1964 by making a 400-foot-wide cut through the offshore coral reef at Discovery Bay with sufficient depth to allow passage of 37,600-ton ore vessels. The operation was being accomplished by means of a dragline mounted on a dredge, with very little drilling or blasting required. Offshore winds prevented daytime operations, thus much of the dredging was done at night.[15] The company also constructed during 1964 two new oil storage tanks with capacities of 54,000 and 45,000 barrels at Port Kaiser to provide additional storage for oil used in drying bauxite. A new car dumper was installed at Port Kaiser, and continued progress was made on the Southhampton railroad extension as well as in developing mining facilities in the Dry Harbour Mountains. The plant site at Port Rhoades was leveled, and access roads and a 1-mile railroad bed near the site also were completed in 1964. Tentative completion date for this project was mid-1967.[16]

In 1963, Kaiser contracted with Bahama Cement Co. to supply the latter with low-grade bauxite for use in the cement to be made at the new plant at Freeport, Grand Bahama. Output of 24,144 metric tons of cement-grade bauxite, presumably by Kaiser for export to Grand Bahama, was recorded in 1964.

Reynolds Jamaica Mines, Ltd., operating in St. Ann Parish, shipped 1,927,000 dry tons of bauxite in 1964, compared with 1,937,000 tons in 1963 and 1,966,000 tons in 1962. Reynolds has maintained extra pits as alternate sites for wet-weather operations. Mined ore is fed into two pairs of kilns, where the wet ore, with an average of 20 percent moisture content, is partially dried to 12.5 percent moisture content before shipment. The average analysis of Reynolds' 1964 ore shipments was 49.7 percent Al_2O_3, 1.3 percent SiO_2, 20.0 percent Fe_2O_3, 2.7 percent TiO_2, and loss on ignition 26.4 percent (including chemically combined water.)

Nonmetals.—*Cement.*—The Caribbean Cement Company's third kiln, part of the firm's $8.4 million expansion program, was completed in 1964. With the new facilities in production, the rated capacity was raised from 200,000 to 400,000 tons a year. Other projects in the company's expansion program included a rock storage building, a raw and finish mill, cement storage sites, and bulk loading facilities.

In 1964, Caribbean Cement marketed approximately 260,000 tons of cement, of which 225,000 tons was sold to domestic users and the remainder was exported. Sales totaled about 61,000 tons more than in 1963. The increase in 1964 was attributed to higher domestic consumption precipitated by a relatively high level of construction activity that began in late 1963 and continued throughout 1964. Imports of cement and other construction materials in 1964, despite significant increases in domestic production of such materials during the year, were about 30 percent ahead of the 1963 rate.

---

[15] Eigo, M. Jamaica Keeps Growing. Two New Projects Will Boost Bauxite Shipments to the U.S. Eng. and Min. J., v. 165, No. 1, January 1964, pp. 50–57.

[16] Barclays Bank D.C.O. (London). Overseas Survey, 1965. The West Indies. Jamaica. p. 164.

Since there was a considerable backlog of construction projects in both the private and public sectors, the high level of construction activity in Jamaica was expected to continue in the immediate future.

Clays.—Worcester Porcelain Co., Ltd., formerly Jamaica Pottery Ltd., was issued a Special Mining Lease and a Special Exclusive Prospecting License for clay in St. Elizabeth Parish. Prospecting by the company was curtailed in the latter part of 1964 when effort was concentrated on constructing a pilot plant for the beneficiation and refining of the Frenchman's clay found in the St. Elizabeth property. Worcester Porcelain surrendered its other two mining leases for clay as its current production plans and those in the foreseeable future will not require all the various clay types covered in these leases.[17]

Fertilizer.—Esso Standard Oil Ltd., S.A., a subsidiary of the Standard Oil Co. of New Jersey, together with the Jamaican Government and a few private Jamaican firms planned to jointly set up a $3-million fertilizer plant as part of a project in the island's agricultural development programs. Other parts of the project included land reclamation for agricultural production and establishment of food processing plants. Total cost of the project was estimated at $4.2 million.[18]

Esso's participation, totaling $3.4 million, included commitments for the construction and operation of the fertilizer plant. Initial capacity of the plant was tentatively set at 60,000 tons of various types of nitrogenous fertilizers a year. The proposed plant will be a conventional ammoniation granulation facility using urea, ammonia solutions, phosphates, potassium muriate, and sulfuric acid as raw materials. Since facilities to produce superphosphates and sulfuric acid were not included in the current plans of the project, these chemicals presumably will be imported.[19]

Gypsum.—Jamaica Gypsum, Ltd., a subsidiary of United States Gypsum Co., remained Jamaica's chief gypsum producer in 1964. The firm curtailed production during the year by about 40,000 metric tons, approximately 16 percent below the 1963 output. Export sales in 1964, however, rose slightly above the previous year's level to 140,000 tons. Local sales of gypsum totaled 18,500 tons in 1964, a record high, compared with 13,500 tons in the preceding year.

Despite the lower output in 1964, gypsum stocks continued to rise, reaching over 411,000 tons at yearend 1964 compared with 374,000 tons at yearend 1963. In 1964, Jamaica Gypsum concluded arrangements with the Jamaican Government for the mining of anhydrite on government land at Halberstadt in St. Andrew Parish. Royalty was to be paid on the anhydrite at the same rate as for gypsum.

Sand.—Silica sand output for use in Jamaica's glass industry in 1964 showed a more than two-fold increase over that of 1963. In 1964, approximately 10,500 tons of sand was supplied to West Indies Glass Co., Ltd., against 5,000 tons in 1963. The maximum monthly capacity of the plant was about 1,450 tons. Utilization of under mesh and extremely fine sand granules to maximize recovery for local manufacture of scouring powders was investigated.

---

[17] World Mining Magazine. Caribbean. Jamaica. Nonmetallic Mineral Output Makes Important Gains in 1964. V. 18, No. 5, May 1965, p. 79.

[18] U.S. Embassy, Kingston, Jamaica. Triple $4.2 Million Agricultural Development Project. Department of State Airgram A–119. Oct. 30, 1964.

[19] Journal of World Nitrogen. Jamaica. No. 34, March 1965, p. 12.

Jamaica Ores Ltd.'s special mining lease for 1.8 square miles was transferred to the firm's parent company, West Indies Glass Co., Ltd., in an attempt to bring about greater organizational efficiency. Jamaica Ores' benefication plant capacity at yearend 1964 was estimated at 8 tons of sand per hour.

Mineral Fuels.—*Petroleum.*—Esso West Indies Ltd.'s new oil refinery in Kingston went into production in early March 1964. The refinery, Jamaica's first, was one of the first and largest projects in the island's industrialization program.[20]

The rate of refining has been scheduled not only to meet the current island demand but also to provide a substantial quantity for export to other Caribbean islands. Employment in the refinery at yearend 1964 included about 100 local citizens. Daily capacities during 1964 were, in terms of barrels, crude petroleum, 28,000; vacuum distillation, 1,500; powerforming, 2,800; naphtha hydrofining, 5,200; gas oil hydrofining, 5,700; and asphalt, 760.[21]

The Kingston refinery has been reported as one of the most modern and efficient. Designed by Esso Research and Engineering Co. and constructed by Arthur G. McKee and Co., Cleveland, Ohio, the refinery was essentially completed on schedule in December 1963. Some of the more important design features of the refinery were the combination of all processing steps into a single unit and the integration and extensive use of heat exchangers. Moreover, the arrangement of processing units at the plant was very compact and all the units were operated from a single control house.[22]

Supplementary to the above refinery, Esso put a $1-million lubricating oil plant on stream in late 1964 at Kingston. The plant has an annual capacity of more than 5 million gallons, a quantity more than sufficient to supply local demand. The excess, like that of the refinery's products, will be exported to Caribbean and Central American countries.

THE NETHERLANDS ANTILLES[23]

The petroleum refineries of Shell Curaçao, N. V., and Lago Oil and Transport Co., Ltd., located on the islands of Curaçao and Aruba, respectively, continued in 1964 to form the economic foundation of the Netherlands Antilles. About 26 percent of the gainfully occupied were working at the refineries or their shipping establishments. However, ever increasing automation resulted in sharp drops in employment and a continuation of the decline of recent years in local expenditures, mainly for wages and salaries. Petroleum was the most important trade commodity in both volume and value, although depressed export prices for petroleum products plus a further drop in the volume of such exports by the Lago refinery on Aruba contributed to the overall trade deficit of the islands.

---

[20] Long, J. Jamaica. The Lamp, v. 46, No. 4, Winter, 1964, pp. 18–21.

[21] World Petroleum. Annual Refinery Review. The World's Processing Plants. Jamaica. July 15, 1964, pp. 80–82.

[22] Hudson, W. B. Caribbean Area's Newest Refinery. World Petroleum, v. 35, No. 2, February 1964, p. 34.

[23] Prepared by Frank E. Noe, Latin America specialist, Division of International Activities.

The mining picture remained relatively unchanged during 1964. The Curaçao Mining Co., the only mining company of any importance, managed to operate at a profit despite declining production and exports of phosphate rock. Salt production also decreased in spite of the initiation of a project to produce 450,000 tons of salt yearly on the island of Bonaire. At yearend a mineral resource survey, conducted by a Swedish geologist under U.N. sponsorship, was underway in the islands of Curaçao, Aruba, and Bonaire.

A significant new contributor to the economy in 1964 was the fertilizer complex of Aruba Chemical Industries, which completed its first full year of operations. However, the results obtained by this wholly owned subsidiary of Standard Oil Co. of New Jersey were characterized as disappointing as production and exports represented less than one-half of plant capacity. Negotiations begun nearly 2 years ago were continued between a U.S. firm and the Antillean and Dutch Governments for the installation of a 45,000-ton-per-year aluminum smelter to be located on Curaçao. The smelter will require an investment of some $50 million, and, additionally, a new power-generating station must be built at an estimated cost of $33 million. Favorable resolution of the remaining problems under discussion should make it possible to begin construction by early 1966.

GOVERNMENT POLICIES AND PROGRAMS

The convention making the Netherlands Antilles an associated member of the European Economic Community and a special oil protocol to the Treaty of Rome regulating Antilles petroleum products imported into the EEC became effective on October 1, 1964. The area is now included in the trading system that permits the associated territory to retain wide tariff autonomy vis-a-vis the EEC Member States and third countries, while the EEC Member States are committed to extend to the associated area the benefits of the gradual reduction of intra-EEC trade barriers. Under the agreement, the Antilles also became eligible to receive financial aid from the European Development Fund and the European Investment Bank for economic and social investments.

PRODUCTION

Output of refined petroleum products declined slightly in 1964. Limestone aggregate which is produced as a byproduct in the phosphate mining operations increased 60 percent over 1963 to a new high. Production of phosphate rock, however, continued the decline begun in 1962. Reported salt production, which may be incomplete, was considerably lower than in 1963. The production reported came from Bonaire only, and, despite the reported resumption of production on Curaçao in 1963, the State Department did not report any production there in 1964.

TABLE 14.—Netherlands Antilles: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Nonmetals:					
Limestone cubic meters	16,085	11,703	21,389	[e] 20,000	31,964
Nitrogenous fertilizers	-----	-----	-----	NA	84,000
Phosphate rock	114,912	151,997	[r] 131,560	128,280	121,382
Salt	114	134	121	281	93
Sulfur, recovered [e]	40,000	40,000	40,000	40,000	40,000
Mineral fuels: Petroleum refinery products:					
Aviation and motor gasoline thousand 42-gallon barrels	39,353	44,240	46,804	43,462	41,200
Kerosine and jet fuel do	20,587	24,455	19,624	18,683	19,380
Distillate fuel oil do	40,291	46,548	48,908	52,027	41,187
Residual fuel oil do	145,605	145,894	157,534	153,442	161,801
Lubricants do	2,367	2,592	2,811	2,774	2,891
Other do	14,890	18,120	14,154	19,215	20,231

[e] Estimate. [r] Revised. NA Not available.

TRADE

In 1964 as in the past, petroleum comprised the bulk of imports and exports. Imports of crude oil and other petroleum products in 1964 were valued at $544.1 million[24] or 83.3 percent of total imports, down slightly from 84.1 percent in 1963. Petroleum exports were valued at $619.5 million or 97.5 percent of total exports, also down from the 1963 percentage of 98.5. Venezuela was the source of almost all the crude oil and most of the refined products.

Nonpetroleum imports rose slightly in 1964, but commodity breakdown was not available at the time of this report. According to consular reports, the United States continued as the principal supplier of nonpetroleum products, supplying about 48 percent of the market. The United States was also the most important market for petroleum products and phosphate exports.

---

[24] Where necessary, values have been converted from Netherlands Antilles florins (Ant.f) at the rate of Ant.f 1 equals US$0.535.

TABLE 15.—Netherlands Antilles: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Metalliferous ores, types not specified	111	223	All to Iran.
Iron and steel:			
Scrap	11,722	17,140	Netherlands 8,600; Japan 5,000; United States 2,425.
Other	1,008	30	Venezuela 15; United States 8.
Nonferrous metals and alloys	8	49	United States 42; Netherlands 5.
Nonferrous scrap	922	1,166	Japan 470; Netherlands 354; United States 168.
Nonmetals:			
Lime	--------	104	United States 92; Venezuela 12.
Phosphate rock	131,552	128,280	United States 108,570; Belgium 19,710.
Salt	12	108	Trinidad 93; Surinam 15.
Nonmetals, n.e.s. [1]	2,642	3,151	Mainly to Surinam.
Mineral fuels:			
Petroleum:			
Crude, thousand tons	380	294	United States 164; Brazil 130.
Refinery products:			
Aviation gasoline, do	1,627	1,588	France 205; Brazil 161; United Kingdom 144.
Motor gasoline, do	2,463	2,548	United States 991; United Kingdom 190; Denmark 150.
Kerosine and white spirit, do	905	930	United Kingdom 171; Canada 160; Norway 60; Sweden 52.
Jet fuel, do	2,300	2,418	United States 1,222; Lebanon 136; Italy 122.
Distillate fuel oil, do	5,771	6,270	Netherlands 1,011; West Germany 909; Canada 637; Sweden 372.
Residual fuel oil, do	21,102	21,054	United States 14,155; Canada 1,185; United Kingdom 1,058.
Lubricants, including greases, do	827	850	United Kingdom 411; Netherlands 173; Brazil 37.
Vaseline, paraffin, and wax, do	15	30	United Kingdom 28; France 1.
Asphalt, do	848	821	United States 525; New Zealand 71; Ireland 65.
Other [2], do	1,086	673	United Kingdom 275; United States 113; Netherlands 100.

[1] Not elsewhere specified.

[2] Includes process oil and cutbacks.

TABLE 16.—**Netherlands Antilles: Imports of metals and minerals**

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys, all forms	127	129	Canada 47; United Kingdom 36; West Germany 16.
Copper and alloys, all forms	226	225	United States 82; United Kingdom 65; Netherlands 43.
Iron and steel:			
Castings and forgings	105	134	Netherlands 101; United States 31.
Shapes and sections	3,689	2,462	Netherlands 1,274; Belgium 656; United States 415.
Hoop and strip	11	289	United Kingdom 286; United States 3.
Plate and sheet	1,991	3,750	Japan 1,013; Netherlands 883; United Kingdom 846.
Wire	114	96	United States 26; Belgium 25; United Kingdom 25.
Pipes, tubes, and fittings	9,240	4,625	United States 1,924; United Kingdom 1,099; West Germany 545; Netherlands 518.
Other	77	192	Netherlands 168; United States 11.
Lead and alloys, all forms	50	86	United Kingdom 45; Netherlands 35.
Nickel and alloys, all forms	3	3	United States 2; United Kingdom 1.
Silver and platinum-group metals, all forms troy ounces	311	2,757	United States 1,817; Netherlands 858, Switzerland 82.
Tin and alloys, all forms long tons	5	5	Netherlands 4; United Kingdom 1.
Zinc and alloys, all forms	90	114	Netherlands 38; United States 28; Belgium 27,
Metalliferous ores, n.e.s. [1]	307	230	All from Surinam.
Nonferrous metal scrap	4	4	Colombia 3; Venezuela 1.
Other nonferrous metals and alloys	4	9	Netherlands 4; United Kingdom 3.
Nonmetals:			
Cement	45,431	38,106	Venezuela 28,412; West Germany 3,550; Netherlands 1,458.
Clay and clay products:			
Common and fire clay	2,012	3,380	United States 2,961; United Kingdom 412.
Common brick	46,266	4,536	All from Netherlands.
Refractory bricks	2,159	1,526	United Kingdom 780; Netherlands 490.
Fertilizer:			
Natural	323	1,990	Mainly from United States.
Manufactured	117	189	United States 120; Netherlands 53.
Lime	958	338	United Kingdom 296; United States 42.
Salt	629	531	United States 468; Canada 32; United Kingdom 20.
Sand	17,489	2,935	Mainly from Surinam.
Sodium carbonate	158	252	United Kingdom 185; United States 35; Netherlands 32.
Sodium hydroxide	30,219	29,412	Netherlands 14,929; United States 11,060.
Stone dimension	55	63	Netherlands 38; Italy 21.
Sulfur		3,462	All from United States.
Nonmetals, n.e.s.[1]	10,916	1,173	United Kingdom 480; United States 392; Netherlands 156.
Mineral fuels:			
Coal, coke and briquets	15	51	All from Netherlands.
Mineral tars and derivatives	67	39	Netherlands 24; United Kingdom 11.
Petroleum:			
Crude thousand tons	39,595	38,884	Venezuela 38,093; Colombia 731.
Natural gasoline do	188	88	Venezuela 71; United Kingdom 17.
Refinery products:			
Aviation gasoline do	432	491	United States 283; Venezuela 177; Trinidad 17.
Other gasoline do	451	463	Venezuela 387; Trinidad 39; United Kingdom 32.
Kerosine and jet fuel do	472	48	Mainly from Venezuela.
Distillate fuel oil do	291	195	All from Venezuela.
Residual fuel oil do	1,665	2,738	Venezuela 2,686; Colombia 36.
Lubricants, including greases do	18	9	All from United States.
Butane do	66	64	All from Venezuela.
Other [2] do	1,747	1,327	Venezuela 1,268; United Kingdom 26; Netherlands 18.

[1] Not elsewhere specified.
[2] Includes process oil and asphalt.

COMMODITY REVIEW

Nonmetals.—*Cement.*—Cement requirements were supplied by imports, mainly from Venezuela. It appeared at yearend that the cement factory proposed for construction on Aruba would not be erected.

Limestone.—The Curaçao Mining Co. increased production of limestone aggregate during 1964 by approximately 60 percent. Most of the production was consumed by the local market, although small quantities were reported to have been exported to Surinam and Venezuela.

Nitrogenous Fertilizers.—The Aruba Chemical Industries (ACI), since mid-1964 wholly owned by Standard Oil (New Jersey), completed its first full year of operations with a production of 28,000 metric tons of ammonia, 25,000 tons of urea, and about 31,000 tons of mixed fertilizers. Although this represented less than one-half of plant capacity, the company anticipated an improvement on this record because of what it has termed "the great demand for chemical products." ACI management stated at yearend that the "outlook for the future is favorable but that output must be increased; the work force should by now be sufficiently trained to reach production goals set by management." Most of the urea and fertilizer produced were exported to Caribbean islands and South America.

Phosphate Rock.—Phosphate rock remained the only important nonfuel mineral produced in the Netherlands Antilles. Almost all of the phosphate produced was exported to the United States, where its low flourine content commanded a premium price. During 1964 the Curaçao Mining Co. continued to be the only producer of phosphate rock. Employment at the mine dropped to 464 compared with 490 in 1963 and 521 in 1962. Faced with the possibility that the phosphate deposits may run out in future years, the company was considering other areas of activity including a stone-crushing plant in Aruba and development of extensive land holdings on Curaçao.

Salt.—On June 24, 1964, a ceremony was held on Bonaire to inaugurate the new project of the International Salt Co. on the island. According to statements made by representatives of International Salt Co., the evaporation process will produce 450,000 tons of salt yearly which will probably be shipped in large vessels to the United States. However, the company expects the salt flats to yield the first salt only after several years. The Bonaire Island Government has granted a 60-year lease for 3,500 hectares of land to the Antilles International Salt Co., N.V. Another 400 acres have been purchased from the E. and G. Martijn Co., which has been conducting a small salt-evaporation operation. Newspapers reported that the company will build its own electric plant. Its total investment will amount to about $6 million; the necessary construction will give employment to 200 workers, and from 60 to 120 Bonairians will be engaged when the company is in full operation. The Antillean Government is expected to invest $350,000 to install the mooring buoys necessary to accommodate the large ships which will carry the salt to its export destination. At yearend it appeared that the ceremonies commemorating the start of operations were perhaps premature in view of the near total lack of progress to date on that multimillion dollar project. According to press reports, the company was seeking a larger financial contribution from the Antillean Government, and this project, like many others, has been delayed pending the receipt of aid funds from the Netherlands.

Minerals Fuels.—During 1964, Antillean petroleum refineries, which ranked among the largest in the world, continued to be the mainstay of the economy. Employment at the refineries, however, continued to drop because of continued automation of refinery operations. Employment was 7,632, compared with 8,712 in 1963 and 9,657 in 1962. Personnel reductions at Lago were especially hard felt, and the company announced that there would be further reductions so that by 1970 the refinery, in all probability, would have a staff of only about 1,000 (1964 employees numbered 2,779). Shell Curaçao also underwent retrenchment, but the Curaçao refinery will continue wherever possible to give notice to non-Antillean labor before laying off native workers. Midway through the year, the unions representing the refinery workers on Curaçao and Aruba signed new 3-year collective working agreements with the two big oil companies which resulted in the introduction in September of a 40-hour 5-day workweek.

In 1964 the Lago Oil and Transport Co. imported 170 million barrels of crude and petroleum products, 6 percent below the 1963 imports. Export of 163 million barrels was 5 percent below the 1963 level. Reportedly, the Lago Oil refinery on Aruba, with a capacity of 460,000 barrels per day, processed approximately 436,000 barrels per day in 1964.[25] The source cited also reports that the company invested $6.4 million in facilities during the year. The Shell Curaçao 280,000-barrel-per-day refinery imported 20.2 million barrels of crude petroleum and partially refined oil which yielded exports of 16.4 million barrels, down 1 percent from 1963. Capital expenditures at the Curaçao plant were estimated at about $3 million. In 1964 the Netherlands Antilles was accepted as an associated member of the European Economic Community (EEC). There was no change in the agreement of November 13, 1962, that, in case of market disruptions, would allow no more than 2 million metric tons of Antillean oil to enter the EEC duty free in any one year. A special oil protocol to the EEC treaty provides certain tariff preferences for the import of Antillean petroleum products and at the same time establishes certain safeguards which can be initiated at either the Community or Member State level. Under the protocol, the European Commission on its own initiative or at the request of a Member State can decide that Antilles petroleum imports are threatening the markets of the Member State concerned and impose duties. An individual Member State may also impose duties if it decides its markets are threatened by the import of Antilles petroleum products, but its action is subject to Commission and, in some cases, Council review. However, an individual Member State may impose duties automatically if its annual imports of Antillean petroleum products exceeds specified quotas. Another provision of the oil protocol is that if the Community decides to impose quotas on imports of petroleum products from third countries, it may also apply them against Antillean products; however, Antillean products would be given priority access over that enjoyed by third country products. This protocol is a provisional regulation pending Community decisions on a common commercial policy, a common energy policy, and a common definition of origin of petroleum products.

---

[25] Adams, Ernestine. International Oil Volumes and Investments Soar. Petroleum Management. V. 37, No. 6, June 1965, p. 100.

SOURCE MATERIALS

Data on production of refined petroleum products was obtained from Standard Oil Co. (New Jersey) reports and from the British Ministry of Power. Other production data were obtained from U.S. State Department airgrams. Trade information came from the Bureau of Statistics by way of the monthly publication, Statistics of Imports and Exports by Commodity. Information on other developments was obtained from World Petroleum, Petroleum Management, International Commerce, and the Wall Street Journal.

TRINIDAD AND TOBAGO[26]

Production, import, refining, and reexport of petroleum and petroleum products continued in 1964 to be the cornerstone of the economy of Trinidad and Tobago. Expansion of the oil industry has been the key element behind Trinidad's comparatively high standard of living and recent boom, and even though small manufacturing industry has also developed fairly well, the economy is still essentially based on oil and sugar for export. Athough the rate of new drilling decreased during the year under review, the production of crude oil reached a new high, although tending to level off, and expansion of the island's internationally important refining facilities continued. A fast growing export-oriented chemical fertilizer industry based upon the use of natural gas assumed a significant role during 1964.

According to the 1965 budget speech of the Minister of Finance, the latest available figures indicated a 1964 gross domestic product (GDP) of about US$635.4 million,[27] up 4 percent from 1963. The principal sectors generating the increase in added value were petroleum (US$8.4 million), public utilities (US$6 million), and manufacturing (US$3.8 million). The increase in the contribution of the manufacturing sector was due almost entirely to the first full year of operation of a US$23-million anhydrous ammonia fertilizer plant of Federation Chemicals, Ltd., an affiliate of W. R. Grace and Co. The output of the petroleum sector was enhanced by the inauguration of a US$27-million lubricating oil plant at the Texaco refinery at Pointe-a-Pierre and a US$6-million platformer/hydrotreater unit at the Shell refinery at Point Fortin. The mining and oil refining industries account for about 30 percent of the GDP, with a small additional but not separately reported percentage furnished by the production of mineral based products.

---

[26] Prepared by Frank E. Noe, Latin America specialist, Division of International Activities.

[27] Where necessary, values have been converted from West Indies dollars (WI$) at the rate of WI$1.00 equals US$0.59.

In 1964 exports rose by about 6 percent to an estimated US$404 million, primarily as a result of major increases in exports of petroleum and petroleum products on the one hand and of agricultural products on the other. Crude and refined petroleum exports accounted for 82 percent of total export value in 1963 and have been estimated to be somewhat higher in 1964. Imports were estimated to be about US$396.5 million or about 4.6 percent above the 1963 level, although these preliminary figures may be subject to extensive revision. About 46 percent of total import value was for crude oil brought to Trinidad for refining and subsequent export or use as ships' bunkers. It is estimated that close to 70 percent of refinery throughput is crude oil imported from Venezuela, Saudi Arabia, Colombia, and the United Arab Republic.

The economy of Trinidad and Tobago has made impressive gains over the last few years, and while growth is expected to continue, it will likely be at a slower rate in the coming years. Inasmuch as the country's economy has been based on petroleum and petroleum products, the Government has continued to seek private investment which would contribute to the growth of the economy on a diversified basis. By the standards of developing countries, the climate for private investment continues to be favorable, the result of such factors as Trinidad's record of political stability, its average per capita income of over US$500 per year, progress in developing social and economic infrastructure, access to British Commonwealth markets at preferential tariff rates, and attractive incentive legislation.

PRODUCTION

Crude oil production in 1964 rose by nearly 2 percent despite a decline of 1 million barrels in the output of Texaco Trinidad Inc., the island's biggest producer. Trinidad's importance as a refining center continued to increase with a 6.1 percent rise in output of refinery products. Production of cement rose almost 9 percent but still remained below the production rates of 1959 and 1960. The value of crude nonmetallic minerals was reported as US$1,217,867, of which limestone accounted for 48 percent, natural asphalt, 22 percent, and sand and gravel, 19 percent.

TABLE 17.—Trinidad and Tobago: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity[1]	1960	1961	1962	1963	1964
Nonmetals:					
Cement thousand tons	177	98	[r] 165	[r] 162	176
Clays do	134	109	97	[r] 103	70
Diorite	7,247	[r] 7,385	7,798	[r] 13,644	14,346
Gypsum	6,571	[r] 3,307	3,645	[r] 3,837	2,931
Limestone thousand tons	959	[r] 870	[r] 720	811	808
Nitrogenous fertilizer [e] do	40	98	85	80	100
Porcellanite do	43	49	68	60	47
Sand and gravel do	882	775	606	749	919
Mineral fuels:					
Natural asphalt do	157	178	165	172	195
Pitch sand	28,656	23,264	18,072	15,155	26,973
Natural gas million cubic feet	[r] 97,653	[r] 102,282	99,948	[r] 99,376	110,732
Natural gas liquids thousand 42-gallon barrels	202	398	194	170	200
Petroleum:					
Crude do	42,358	45,768	48,876	48,678	49,730
Refinery products:[2]					
Aviation gasoline do	4,150	3,826	3,833	[r] 970	977
Motor gasoline do	10,391	12,671	12,955	[r] 18,302	17,747
Kerosine and jet fuel do	6,957	10,406	10,601	[r] 9,482	11,845
Distillate fuel oil do	13,316	16,472	17,502	[r] 20,055	19,658
Residual fuel oil do	44,487	56,346	60,457	[r] 66,271	71,287
Liquefied petroleum gases do	42	48	71	109	146
Lubricating do	2	1	2	2	406
Other	[r] 5,688	[r] 7,762	[r] 951	[r] 693	840

[e] Estimate. [r] Revised.

[1] Sulfur is also produced, but production statistics are not available.

[2] Data for 1960–62 from U.S. Embassy dispatches; 1963–64 data from December issue of Monthly Bulletin of the Trinidad and Tobago Petroleum Industry, a publication intially issued in 1964 by Ministry of Petroleum and Mines.

TRADE

Exports of refined products rose from 103 million to 115 million barrels, while exports of crude oil declined from 3.8 to 3.4 million barrels. Canada is the recipient of crude oil exports, while the United States, United Kingdom, and the Netherlands are the principal destinations of refined products. There has been no significant change in the customary trade pattern.

Imports of crude petroleum and petroleum products by Trinidad and Tobago for 1964 were estimated at US$210 million, as compared with US$176 million in 1963. Imports of crude oil increased 19 percent over the preceding year to 83.2 million barrels. Venezuela and Saudi Arabia were the principal suppliers, with 39.7 million and 30.4 million barrels, respectively. Imports of crude oil from Colombia rose by 200,000 barrels to about 12 million, while the supply from the United Arab Republic dropped from 2.2 million barrels in 1963 to about 883,000 barrels in 1964. Approximately 235,000 barrels was obtained from Indonesia during the year. Imports of refined products fell approximately 27 percent to 458,000 barrels.

TABLE 18.—Trinidad and Tobago: Exports and reexports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Scrap	24	16	United Kingdom 10; Australia 4.
Metal and alloys, other forms	40	731	British Guiana 677; Barbados 27.
Copper:			
Scrap	431	191	Netherlands 71; Japan 61; West Germany 43.
Metal and alloys, other forms	69	3	Netherlands 1; British Guiana 1.
Iron and steel:			
Scrap	20	753	Japan 398; Puerto Rico 254.
Pig, sponge and primary forms	2	2	British Guiana 1; stores and bunkers 1.
Semimanufactures:			
Structural shapes	183	254	Puerto Rico 195; St. Vincent 28.
Plates and sheets, all types	77	326	Barbados 234; British Guiana 76.
Other	82	60	Antigua 24; British Guiana 9; St. Vincent 5.
Lead:			
Scrap	138	128	United Kingdom 106.
Metal and alloys, other forms	6	(1)	Mainly to Venezuela.
Nickel and alloys, wrought	3	2	Mainly to Venezuela.
Zinc, zinc alloys and scrap	8	8	All to United Kingdom.
Nonferrous scrap, unclassified	764	221	Japan 145; Netherlands 51.
Nonmetals:			
Cement	[2] 6	(3)	British Guiana; Guadeloupe; Barbados.[3]
Clay and clay products:			
Clays	(1)	(1)	Mainly to Barbados.
Common brick	70	18	St. Vincent 7; British Virgin Islands 7
Fertilizer:			
Natural	-------	2	Grenada 1; Barbados 1.
Manufactured:			
Nitrogenous	75,333	84,213	Jamaica 23,715; British Guiana 21,007; Barbados 6,745.
Phosphatic	1	4	British Guiana 2; Grenada 1; Montserrat 1.
Potassic	3	4	Montserrat 2; Grenada 2.
Mixed	-------	2	All to Grenada.
Gravel and crushed rock	13,829	763	Surinam 714; Barbados 41.
Lime	1,057	1,069	Barbados 592; St. Kitts Nevis 341.
Salt	15	275	Mainly to British Guiana.
Sand	64	46	Stores and bunkers 24; St. Lucia 17.
Stone	35	1	Mainly to Grenada.
Other nonmetals	894	814	Mainly to stores and bunkers.
Mineral fuels:			
Coal and coke	751	290	Barbados 236; St. Lucia 15.
Gas, manufactured	2,332	5,517	Guadeloupe 2,592; Barbados 699; Surinam 682.
Mineral tar	4	2	All to stores and bunkers.
Natural asphalt	66,393	68,814	United Kingdom 50,425; West Germany 722.
Petroleum:			
Crude......thousand 42-gallon barrels	4,047	3,773	All to Canada.
Partially refined......do	2,792	3,659	United States 2,592; Puerto Rico 1,067.
Refinery products:			
Aviation gasoline......do	12,099	10,999	United States 3,119; United Kingdom 1,583; Spain 1,513; France 1,289.
Motor gasoline......do	9,122	10,383	United Kingdom 4,737; France 1,715; Sweden 888.
Kerosine......do	2,005	972	Stores and bunkers 229; United Kingdom 208; Jamacia 127.
Distillate fuel oil......do	17,064	19,076	Netherlands 5,905; United Kingdom 3,060; Sweden 2,942.
Residual fuel oil......thous. 42-gal. bls	59,230	64,659	United States 33,634; United Kingdom 9,704.
Lubricants, including greases	376	645	Stores and bunkers 209; Barbados 176; British Guiana 132.
Asphalt	50,372	36,690	Rep. of South Africa 15,511; Jamacia 6,205; Guadeloupe 5,810.
Tar oil	37,951	21,739	United Kingdom 16,904; Netherlands 2,983.
Other	11,389	7,762	Barbados 2,089; Grenada 1,075; British Guiana 999.

---

[1] Less than ½ unit.
[2] Does not include portland cement; tonnage unspecified, valued at BWI$2,523,380 (US$1,488,794).
[3] Total and country tonnages not given. Total value BWI$2,271,548 (US$1,340,213).

Source: Government of Trinidad and Tobago. Central Statistical Office. Overseas Trade, 1962 and 1963, Part B.

TABLE 19.—Trinidad and Tobago: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys, all forms	987	451	United Kingdom 203; United States 114; West Germany 61.
Copper:			
Sulfate	16	37	All from United Kingdom.
Metal and alloys, all forms	226	165	United Kingdom 122; United States 23.
Gold, unrefined and partly worked ... troy ounces	27,223	5,699	United Kingdom 5,324; Canada 278.
Iron and steel:			
Ore and concentrate	--------	9	All from United States.
Scrap	1,458	33	United States 31.
Pig, sponge, and primary forms	757	965	United States 404; Canada 301; United Kingdom 119.
Semimanufactures:			
Structural shapes	13,137	10,267	United Kingdom 4,320; Belgium-Luxembourg 3,249.
Plates and sheets, all types	16,499	32,523	United Kingdom 27,219; Netherlands 2,436; Australia 1,469.
Pipe and tubes	45,174	35,026	United Kingdom 27,102; United States 4,556.
Other	937	653	United Kingdom 516; Belgium-Luxembourg 67.
Lead:			
Ore	--------	1	All from United Kingdom.
Scrap	--------	4	All from United States.
Metal and alloys, all forms	77	130	Jamaica 96; United Kingdom 28.
Nickel and alloys, all forms	5	6	Canada 5; United Kingdom 1.
Platinum, all forms ... troy ounces	367	21	Mainly from United Kingdom.
Silver, including partly wrought ... do	15,833	13,637	United Kingdom 13,345; United States 152.
Tin and alloys, all forms ... long tons	557	769	United Kingdom 375; Canada 238.
Zinc and alloys, all forms	50	35	United Kingdom 30; United States 3.
Nonferrous metals, scrap and ores	379	24	United Kingdom 18; United States 5.
Nonmetals:			
Abrasives, natural	10	2	Mainly from United Kingdom.
Barite, crude and ground	42,784	41,051	Brazil 28,972; United States 11,481.
Cement	14,368	18,389	Venezuela 13,346; United Kingdom 4,092.
Clay and clay products:			
Clay	1,067	556	United States 347; United Kingdom 194.
Common brick	69	27	United Kingdom 22; United States 5.
Refractory brick	963	936	United Kingdom 495; United States 279.
Feldspar	768	50	All from United Kingdom.
Fertilizers:			
Natural	55	70	United States 55; West Germany 15.
Manufactured:			
Nitrogenous	1,077	1,385	West Germany 1,039; Italy 102.
Phosphatic	1,113	390	Netherlands 230; West Germany 102.
Potassic	2,853	3,018	West Germany 2,560; East Germany 356.
Mixed	1,659	943	West Germany 413; Italy 356.
Graphite	--------	(1)	Mainly from United Kingdom.
Gravel and crushed rock	403	400	Mainly from Italy.
Lime	995	82	Mainly from United Kingdom.
Magnesite	40	32	Netherlands 24; Belgium-Luxembourg 8.
Mica	1	7	United Kingdom 5; United States 2.
Salt	6,252	6,976	United Kingdom 3,624; Canada 1,230; Jamaica 604.
Sand	53	74	United Kingdom 33; United States 24.
Sodium carbonate	1,976	1,357	Mainly from United Kingdom.
Sodium hydroxide	2,264	2,325	United Kingdom 1,939; United States 220.
Stone:			
Dimension	121	178	Italy 168.
Industrial	2,320	6,827	Venezuela 6,075; Barbados 745.
Sulfur	9,910	11,308	Mainly from United States.
Other nonmetals	404	316	France 183; United Kingdom 127.

See footnote at end of table.

TABLE 19.—Trinidad and Tobago: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Mineral fuels:			
Coal and coke	1,815	505	United States 459; United Kingdom 46.
Gas, manufactured	37	26	United States 22; West Germany 3.
Mineral tar	45	23	Sweden 11; United Kingdom 11.
Mineral wax	6	10	All from United States.
Petroleum:			
Crude and partially refined thousand 42-gal. barrels	64,592	69,863	Venezuela 29,834; Saudi Arabia 27,253; Colombia 11,211.
Refinery products:			
Aviation gasoline do	-------	16	All from Puerto Rico.
Motor gasoline do	-------	107	All from Venezuela.
Distillate fuel oil do	140	(1)	All from United Kingdom.
Residual fuel oil do	(1)	(1)	Mainly from United States.
Lubricants including greases	7,158	8,807	United States 5,106; United Kingdom 3,379.
Vaseline and paraffin	117	170	West Germany 72; United States 46; Netherlands 40.
Tar oils	88	23,395	Venezuela 22,669.
Other	4,720	3,080	United Kingdom 2,843.

[1] Less than ½ unit.

Source: Government of Trinidad and Tobago. Central Statistical Office. Overseas Trade 1962 and 1963, Part B.

COMMODITY REVIEW

Metals.—All requirements for metals were met by imports. Bauxite, mined in Surinam, was brought to Trinidad in shallow draft vessels for transshipment to large freighters, without entry in the customs record.

Nonmetals.—Most nonmetal requirements were supplied wholly or in large part from local production. Major exceptions continued to be sulfur, salt, and barite.

An expansion of urea manufacturing facilities of the Federation Chemicals Ltd., was completed in the fall. The original urea plant had initial design capacity of 23,000 tons per year using the once-through process of Dutch State Mines. When ammonia facilities were expanded, the urea plant was converted to a total recycle plant, increasing its capacity to 50,000 tons per year. The process consists of a 2-step high-pressure reaction system whereby ammonia and carbon dioxide are combined to form urea and water. The expanded plant was reported to be operating at full capacity at yearend. Construction of a second major ammonia plant of some 230,000 tons per year was announced in June. The first of two seagoing tankers for moving anhydrous ammonia from Trinidad to the United States and other world markets was launched in January 1964. Both vessels are designed to carry either 9,000 short tons of anhydrous ammonia at −28° Fahrenheit, or a refrigerated propane cargo at −44° Fahrenheit. Capacity for propane shipments is 80,000 barrels.

Mineral Fuels.—*Asphalt.*—Trinidad's pitch lake supplied road surfacing material both for local use and for export. The increasing use of substitute roadbuilding materials in the United Kingdom, the principal market for Trinidad asphalt, continued to pose a competitive threat to Trinidad's exports. Crude asphalt is extracted by the Trinidad Lake Asphalt Co., Ltd., and by the Government. Production and exports by the private company increased 18 and 16 percent, respectively. Data on Government operations were not available.

Natural Gas.—Reserves for 1964 were estimated at 2.442 trillion cubic feet. Output of natural gas, almost all dissolved in or associated with crude oil, increased 10 percent to a new peak. Natural gas consumption at the new ammonia plant was estimated at about 28 million cubic feet per day, part of which came from Shell Trinidad, Ltd., via the new Penal-Port of Spain pipeline and part from Texaco's Pointe-a-Pierre refinery. Towards yearend BP (Trinidad) Ltd., signed an agreement for the sale of natural gas from sources in and offshore Trinidad, to Federation Chemicals Ltd. The agreement allows for the supply of a minimum of 21 million cubic feet of gas per day and a maximum of 25 million cubic feet per day for a period of 15 years beginning in January 1966.

Petroleum.—Well completions fell to the lowest number for several years, while the footage drilled dropped from 1,246,248 in 1963 to 1,056,609. Of the 190 wells completed during the year, 167 were oil producers and 3 were gas producers.

During 1964 Trinidad and Tobago realized a new crude oil production peak by registering a total of 49.7 million barrels. The previous peak had been set in 1962 with 48.9 million barrels. Significant annual production gains were registered by Trinidad Northern Areas (an increase of 1.25 million barrels) and BP (Trinidad) Ltd. (1.15 million barrels), whereas decreases accrued to Texaco Trinidad, Inc. (1.01 million barrels), Shell Trinidad, Ltd. (0.21 million barrels), and Trinidad Canadian Oils, Ltd. (0.14 million barrels). Despite the indicated decline in production, Texaco Trinidad remained the island's biggest producer with 16.6 million barrels. The biggest producing field in Trinidad was the Soldado North marine field which averaged about 46,000 barrels per day to account for nearly a third of the country's total output. Production from all marine fields averaged 55,459 barrels per day, while all land wells together produced an average of 80,418 barrels per day.

Texaco Trinidad's Pointe-a-Pierre refinery, already one of the 10 biggest in the world, became larger during the year when the company added an additional 25,000 barrels per day to crude charge capacity, lifting that figure to 300,000 barrels per day. Average daily throughput for the Texaco refinery was 298,531 barrels as compared with 281,300 barrels per day in 1963. The 50,000-barrel-per-day refinery operated by Shell Trinidad at Point Fortin handled an average of 49,909 barrels per day, up 3,300 barrels per day from 1963. The latter plant processes only local crude, while about 72 percent of Texaco's total throughput comes from imported supplies. Texaco completed and placed on stream during the year a 2,700-barrel-per-day lubricating oil plant which includes units for vacuum distillation, furfural refining, solvent dewaxing, and hydrofinishing.

A significant event in 1964 was the release of the report of the Commission of Inquiry Into the Oil Industry of Trinidad and Tobago, 1963–64. The report stressed the importance of the oil industry in Trinidad's economy and made a number of recommendations designed to strengthen the refining and petrochemical sectors and to give the Government greater control over oil industry operations. Proven oil reserves for 1964 were given at approximately 526 million barrels, and natural gas reserves were placed at 2.4 trillion cubic feet. The report pointed out that in 10 to 15 years the Government of Trinidad would be unable to count on revenue at present levels from the crude oil producing sector of the industry unless new oil reserves are discovered. However, the long term outlook for more commercial oilfields is poor. There have been none of importance discovered in the last 3 years, and there is a limited area for the discovery of future reserves. Therefore, secondary recovery operations assume a special importance.

The established industry maintained substantial advantages. The location of Trinidad is strategically market oriented, and a great deal of capital has been tied up in production and refining facilities, with perhaps the greatest of all assets being the elaborate low cost refining operations. The latter presented a good safeguard for the future but will require the cooperation of government, industry, and the labor unions to meet competition from other low cost producing areas.

Recommendations of the Commission for long term objectives included maintenance of production costs for crude oil and natural gas, as well as refining operations, at levels that are as low as possible to meet competition; maximized utilization of natural gas; provision of incentives to attract new capital into the various stages of the industry and its satellites; modification of the existing tax system and other fiscal burdens and their mode of application; and introduction of a guaranteed minimum of total government income per barrel of crude produced. To obtain these objectives, the Commission of Inquiry recommended the adoption of a new national oil policy and, for the derivation and implementation of such a policy, the creation of a Central Petroleum Administration within the Ministry of Petroleum and Mines. For coordination of government policy, establishment of a special petroleum committee within the cabinet and under the chairmanship of the Prime Minister was recommended. At present, the Ministers of Agriculture and Finance, and other government officials have certain vested responsibilities for the Government control of the oil industry; unification of these responsibilities under the Minister of Petroleum and Mines would insure better coordination and surveillance over the various branches of the industry.

SOURCE MATERIALS

Production statistics were obtained from the Monthly Bulletin on the Trinidad and Tobago Petroleum Industry published by the Ministry of Petroleum and Mines, various publications of the Central Statistical Office, as well as from airgrams from the U.S. Embassy in Port of Spain. Trade statistics were taken from 1962 and 1963 Annual Reports on Overseas Trade by the Central Statistical Office. Information pertaining to recent developments was provided by the U.S. Embassy; various issues of Petróleo Interamericano and Petroleum Press Service were heavily drawn upon.

The Mineral Industry of Argentina

By Charles L. Kimbell[1]

◆

DESPITE overall increases in production of metalliferous ores, nonmetallic minerals (except construction materials) and mineral fuels and with only a modest decline in output of crude construction materials, the value of crude mineral production in Argentina in 1964 declined by 7.7 percent, to $362 million (M$N50,653 million),[2] primarily as a result of a pronounced erosion in the unit value of crude oil, the commodity which in 1964 accounted for more than 76 percent of the crude mineral output value. The overall value of mineral industry output, comprising the value of crude mineral production plus the value of iron and steel production, nonferrous metal smelter products, cement, and petroleum refinery products, was not reported but presumably increased somewhat with respect to 1963 levels since output of steel, cement, and total petroleum refinery products all increased significantly. The value of crude mineral output was equivalent to about 2.2 percent of the nation's 1964 gross domestic product, which increased 8.4 percent over the 1963 level, to $16,303 million in 1964.

Argentine mineral production continued to be diversified but was of little importance to the rest of the world and was insufficient to meet internal needs in the case of many commodities. As a result, mineral import value again exceeded that of mineral exports, and in fact, partial figures indicate that the net annual exchange loss to Argentina resulting from mineral trade apparently was greater in 1964 than in 1963 when it stood at $154 million.

The mineral industry remained a minor employer of the Argentine labor force in 1964; mining operations engaged less than 0.5 percent of the labor force and the industry as a whole probably employed no more than 1 percent of the total.

Major developments in the Argentine mineral industry in 1964 were in the area of proposals and plans rather than in radical changes in existing facilities. There was considerable discussion and study of expanding crude steel production through erection of additional facilities at existing plants and establishment of new enterprises, but no major construction was started. The Zapla steel plant operated considerably under rated capacity for most of the year, but output was being increased at yearend. A plant for production of aluminum and other materials from lateritic clays in northern Argentina was proposed. Plans to expand coal output and increase coal transportation facilities were announced late in the year. In the area of mineral exploration, investigations of the Sierra Grande iron ore deposit continued and a cooperative United Nations-Argentine Government search for copper mineralization reportedly found several areas justifying detailed study.

---

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from Argentine pesos (M$N) to U.S. dollars at the annual average exchange rate for 1964 of M$N139.77 equals US$1.00. Actual exchange rate varied during the year.

GOVERNMENT POLICIES AND PROGRAMS

Efforts continued throughout the year to settle problems created by the oil exploration and development contract annulments of late 1963 but, except for a financial settlement with one producer in November 1964 resulting in acquisition of the fields of this firm by Yacimientos Petrolíferos Fiscales (YPF), the installations remained in the hands of the private oil operators who continued to produce oil for YPF.

During the third quarter of the year, two bills were introduced in the Chamber of Deputies to modify the so-called Savio Law, the republic's basic law for steel industry development. Modifications sought included restriction of private shareholders participation in Sociedad Mixta Siderúrgíca Argentina (SOMISA) to 49 percent (the Frondizi Government had changed the basic law to permit more than 50 percent private ownership, but in practice, less than 1 percent of stock was in private hands); provision for the private participation to be dominated by small investors rather than big financial groups and some effort to better balance the Board of Directors of SOMISA to give the Government a more fair representation relative to its share of ownership. (The Board, as constituted in 1964, had four Government representatives and four private representatives although ownership was more than 99 percent Government and less than 1 percent private.)

On October 7, the executive branch of the Argentine Government issued a decree designating SOMISA, the predominantly State-owned steel company, as the sole firm that could import certain sizes and shapes of structural steel semimanufactures. This apparently represented an effort to restrict imports of these materials, which are produced in Argentina.

The National Government as well as several Provincial Governments continued minerals exploration activities during the year. By Decree-Law 6847, the Instituto Nacional de Geología y Minería (National Institute of Geology and Mining) was authorized to take over and expand the functions of the Dirección Nacional de Geología y Minería. Geological activities of other State entities reportedly were transferred to the new agency. An effort was underway to create a cabinet-level post to supervise and foster geological and other mineral-oriented government activities; through yearend, this responsibility was vested in an Under Secretary of Mining within the Secretaría de Industria y Minería.

PRODUCTION

Although the decline of 7.7 percent in the value of crude mineral production was mainly attributed to the mineral fuels sector of the industry, that sector continued to account for over 85 percent of the total value of crude mineral output, as shown in the following tabulation:

	1962	1963	1964
Value of crude mineral production____million dollars__	310.6	392.8	362.4
Percentage distribution of output value by product:			
Metal ores and concentrate____percent__	3.6	3.1	4.0
Nonmetals:			
Construction materials____do____	7.2	7.6	8.0
Other____do____	2.7	2.0	2.6
Total____do____	9.9	9.6	10.6
Mineral fuels____do____	86.5	87.3	85.4
rand total____do____	100.0	100.0	100.0

The most notable increases in production were the gains in output of pig iron, crude steel, steel semimanufactures, cement, coal and petroleum refinery products, which, with the exception of coal, are not reflected in the preceding table on value of output because the value of production of these processed mineral commodities was inseparable from that of other manufactures in available statistics.

TABLE 1.—Argentina: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Metals:					
Beryl, about 11 percent BeO____	[1] 1,050	[1] 1,350	224	377	188
Bismuth, content of concentrate____kilograms__	[e] 6,750	[e] 3,900	[r] 3,223	[r] 610	4
Columbite-tantalite____do____	____	[e] 2,937	240	600	____
Copper, content of concentrate____	516	551	405	391	345
Gold____troy ounces__	3,504	[r] 2,251	[r] 827	313	303
Iron and steel:					
Iron ore____thousand tons__	[r] 135	139	121	94	95
Pig iron and ferroalloys____do____	180	[r] 396	397	424	589
Crude steel:					
Ingots____do____	234	[e] 407	628	894	NA
Castings and forgings____do____	43	[e] 35	29	19	NA
Total____do____	277	442	657	913	1,265
Semifinished steel:					
Billets____do____	NA	250	375	433	504
Blooms____do____	NA		46	108	299
Slabs____do____	NA	2	33	110	52
Total____do____	[e] 190	252	454	651	855
Steel semimanufactures:					
Reinforcing bars____do____	164	208	175	129	212
Wire rods____do____	175	215	172	218	252
Flats____do____	82	89	73	49	95
Hot strips____do____	77	102	78	66	75
Angles, beams, moldings____do____	82	109	90	58	117
Pipe____do____	96	100	89	62	84
Rounds, squares, hexagonals____do____	71	67	48	36	81
Sheets____do____	13	14	35	133	400
Other____do____	8	5	3	8	15
Total____do____	768	909	763	759	1,331
Cold rolled strip____do____	26	27	NA	NA	NA
Lead:					
In ore and concentrate____	26,700	28,400	29,580	[r] 26,465	[r] 25,924
Metal____	[r] 25,700	[r] 28,000	[r] 24,500	24,000	23,000
Manganese ore:					
30 to 40 percent Mn____	22,000	17,893	12,629	11,282	19,400
Under 30 percent Mn____	[e] 26,453	22,011	16,616	17,933	17,868
Total____	48,453	39,904	29,245	29,215	37,268

See footnotes at end of table.

TABLE 1.—Argentina: Production of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Metals—Continued					
Silver .... thousand troy ounces	1,672	1,431	2,086	1,936	1,945
Tin, in concentrates .... long tons	238	515	231	[r] 225	343
Tungsten concentrates, 60 percent WO_3 equivalent	810	809	576	144	66
Uranium:					
Ores	1,792	3,136	[r] 943	[r] 4,669	21,757
Oxide, U_3O_8, content	[e] 6	[e] 5	[r] 5	[r] 9	[r] 34
Vanadium, in concentrates	----	[e] 10	[r] 14	[r] 3	31
Zinc:					
In concentrates	35,400	32,207	[r] 31,424	[r] 28,261	[r] 22,913
Metal	16,000	14,400	16,771	19,700	22,200
Nonmetals:					
Asbestos	----	----	[r] 184	[r] 331	[r] 492
Barite	24,482	28,555	12,536	[r] 22,997	13,705
Basalt and related rocks	132,796	117,940	103,497	[r] 187,851	183,108
Borates, tincal and ulexite	4,551	6,836	18,551	[r] 24,215	16,827
Calcite	NA	NA	4,950	19,970	4,512
Calcium carbonate	NA	NA	24,181	18,481	33,685
Cement .... thousand tons	2,641	2,903	[r] 2,948	[r] 2,519	2,817
Clays:					
Bentonite	27,923	31,857	29,055	[r] 34,066	34,728
Foundry mold earth	1,058	2,395	[r] 1,361	[r] 2,215	1,911
Fuller's earth	3,402	3,643	3,980	4,614	3,602
Kaolin	41,031	36,415	[r] 38,707	[r] 35,899	[r] 42,380
Refractory clay	62,176	123,553	[r] 94,329	[r] 76,289	94,020
Miscellaneous	308,199	227,904	[r] 267,516	[r] 234,418	289,139
Diatomite	[e] 4,400	1,167	3,394	[r] 5,675	7,772
Dolomite	30,630	37,123	[r] 61,494	[r] 123,580	99,512
Feldspar	8,553	11,658	[r] 7,361	[r] 12,801	6,493
Fluorspar	12,472	10,074	[r] 12,518	[r] 9,762	[r] 9,974
Garnet, almandite	----	----	[r] 60	[r] 150	[r] 90
Granite and related rocks .... thousand tons	1,543	1,810	[r] 2,027	[r] 2,549	2,204
Graphite	488	778	425	[r] 278	155
Gypsum	144,981	180,004	214,989	[r] 196,098	150,502
Limestone .... thousand tons	5,465	7,137	[r] 7,045	[r] 6,549	6,565
Lime .... do	[e] 1,000	[e] 1,000	NA	NA	NA
Lithium minerals	139	402	450	[r] 1,436	725
Marble and related materials:					
Aragonite	NA	NA	416	----	----
Marble and crystalline limestone	9,979	14,553	[r] 10,689	[r] 21,632	9,591
Onyx	1,181	954	896	[r] 499	300
Travertine	3,241	3,238	2,794	[r] 4,356	3,387
Marble rubble	18,503	25,822	[r] 28,563	[r] 20,395	20,907
Mica	[1] 180	[1] 336	49	89	318
Mineral water	13,347	12,418	12,870	[r] 11,622	10,436
Ocher	202	92	129	70	25
Phosphates, guano	356	161	182	[r] 811	180
Rhodochrosite, ornamental	176	172	----	----	----
Rubble, coarse .... thousand tons	807	1,351	[r] 1,135	[r] 1,799	1,302
Salt:					
Rock	1,056	1,900	[r] 1,622	[r] 3,158	1,728
Other	569,999	415,581	[r] 555,867	[r] 272,074	391,384
Total	571,055	417,481	[r] 557,489	[r] 275,232	[r] 393,112
Serpentine	4,887	7,298	6,816	[r] 15,739	8,295
Silica:					
Quartz	34,853	59,199	[r] 31,263	[r] 29,628	15,928
Quartzite	654,761	773,874	[r] 864,498	[r] 894,101	765,820
Sandstone	3,020	29,394	[r] 35,445	[r] 29,001	26,156
Sand for construction .... thousand tons	[e] 3,170	3,177	[r] 3,711	[r] 5,867	4,742
High purity silica sand .... do	102	121	[r] 100	[r] 82	99
Slate	NA	NA	----	600	81
Strontium minerals, celestite	----	----	----	[r] 540	30
Sulfur, elemental	39,895	22,539	22,661	[r] 22,696	[r] 22,307
Sulfates, hydrous:					
Aluminum (alum)	7,385	8,513	[r] 7,732	[r] 10,926	12,716
Iron (melanterite)	730	452	----	----	----
Magnesium (epsomite)	2,503	1,541	1,942	[r] 2,447	2,613
Sodium (mirabilite)	10,686	11,199	11,249	[r] 9,856	9,062
Talc, soapstone, and pyrophyllite:					
Pyrophyllite	NA	NA	13,473	8,918	7,245
Steatite	NA	NA	200	3,080	6,409
Talc	19,041	18,711	[r] 15,035	[r] 16,063	[r] 10,753
Vermiculite	317	491	2,687	[r] 2,780	[r] 3,657
Volcanic materials: Ash, pumice and pozzolana	15,035	29,321	[r] 11,717	[r] 16,878	3,194
Zeolites	410	----	----	[r] 70	80

See footnotes at end of table.

TABLE 1.—Argentina: Production of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Minerals fuels:					
Asphaltites:					
Raphaelite	2,620	1,076	1,972	2,557	1,969
Other	6,159	3,671	1,066	2,875	2,432
Total	8,779	4,747	3,038	5,432	4,401
Carbon black	----------	----------	NA	5,815	NA
Coal, bituminous ...thousand tons	280	344	286	207	332
Coke, oven and beehive [e]	250	400	500	600	650
Coke, low temperature [e] ...thousand tons	60	60	60	60	60
Peat	[e] 3,000	[e] 3,000	2,250	10,825	3,877
Petroleum and natural gas:					
Natural gas, marketed ...million cubic feet	51,607	[r] 87,937	[r] 110,090	[r] 125,564	[e] 148,500
Natural gasoline thousand 42-gallon barrels	93	75	86	102	[1] NA
Petroleum, crude ...do	64,132	84,418	98,154	97,221	100,370
Petroleum refinery throughput ...do	85,703	92,112	105,539	103,181	108,748
Petroleum refinery products:					
Aviation gasoline ...do	481	412	400	322	389
Motor gasoline ...do	16,588	19,046	23,563	22,048	22,733
Jet fuel ...do	----------	221	492	609	749
Kerosine ...do	7,947	7,735	9,236	7,572	8,418
Distillate fuel oil ...do	11,672	12,378	14,973	19,368	17,886
Residual fuel oil ...do	35,884	38,834	39,429	36,804	40,243
Lubricants, including greases ...do	1,004	1,096	1,062	860	935
Other ...do	6,105	4,376	8,020	8,086	8,508
Total ...do	79,681	84,098	97,175	95,669	99,861
Refinery fuel and losses ...do	6,022	8,084	8,364	7,512	8,887

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] Exports.

TRADE

Argentine imports of crude and processed mineral industry products in 1964 continued to far exceed exports of these commodities in terms of value; complete data for 1964 were not available but partial returns indicate an even greater disparity than in 1963 when mineral imports exceeded mineral exports by almost $154 million, as shown by the following summary of trade value data:

	Value of trade in 1963 (thousand U.S. dollars)[1]	
	Exports	Imports
Mineral commodities:		
Metal ores and metals	22,539	128,547
Nonmetals	2,070	4,000
Mineral fuels	11,474	57,440
Total	36,083	189,987
All other commodities	1,329,003	790,690
Grand total	1,365,086	980,677

[1] As reported in official trade statistics; conversions from Argentine monetary units were made by the Argentine Government at varying rates.

Data for 1964, covering imports of 31 commodities, including all major fuel items but excluding pig iron, steel ingots, and semimanufactures of most metals, showed an increase of $29.3 million for these items, to $98.5 million, compared with 1963 imports. In contrast, export data for 1964 covering 37 commodities, also excluding pig iron, steel ingots, and semimanufactures of most metals, showed a decline of $5.7 million for these items, to $11.7 million, between 1963 and 1964. Almost 80 percent of the increase in the imports reported was accounted for by a 90-percent increase in gas-oil imports and a 70-percent increase in crude oil imports (both on the basis of quantity), while a sizable part of the export reduction was due to reduced shipments in 1964 of zinc bars (down almost 60 percent), crude oil (down 84 percent), and residual fuel oil (down 23 percent).

TABLE 2.—Argentina: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum, all forms, unmanufactured	12	1,757	Brazil 570; Peru 461; United States 212.
Beryl	905	748	All to United States.
Copper:			
Concentrates:			
Straight copper	1,708	2,155	West Germany 2,082.
Copper-silver	----------	57	All to Japan.
Matte	209	17	All to West Germany.
Metal, unalloyed, all forms	12	5	All to Brazil.
Bronze slabs, dross, and scrap	1,934	----------	
Bronze and brass, all forms	5,142	301	United States 117.
Iron and steel:			
Scrap	75	2	All to Paraguay.
Ingots	----------	70	All to Uruguay.
Semimanufactures:			
Bars, plates, and sheets	1,534	41,137	United Kingdom 10,701; United States 8,726; Brazil 5,133.
Structural shapes	113	2,382	Uruguay 2,174.
Galvanized plates	79	138	All to Bolivia.
Rods	412	37,441	United States 21,888; Brazil 13,658; Uruguay 1,486.
Wire	2,646	3,354	Brazil 2,423; Paraguay 830.
Pipes and fittings	404	28,715	Venezuela 13,304; United States 11,729; Chile 2,739.
Forms not elsewhere specified	5	1,097	Uruguay 885.
Lead:			
Ore and concentrate	----------	270	All to West Germany.
Metal, all forms	3	3	All to Paraguay.
Silver:			
Ingots, bars, grains, and other forms troy ounces	785,989	731,108	Brazil 514,798; United Kingdom 176,829; West Germany 32,408.
Residues, dross, and powders, including those of gold and platinum kilograms	31,242	19,020	All to United Kingdom.
Tantalite kilograms	1,650	2,050	All to United States.
Tin:			
Tin concentrates long tons	137	47	United Kingdom 41.
Tin-silver concentrates do	1,374	1,384	All to United Kingdom.
Tin and silver dross and residues do	164	11	All to United Kingdom.
Tungsten concentrate	2,100	1,042	United States 568; West Germany 399.
Zinc:			
Concentrate	19,682	47,372	Belgium 20,628; Japan 16,411; Poland 8,428.
Ingots and bars	----------	3,179	Brazil 3,149.
Other, types not elsewhere specified:			
Ores	205	729	Italy 499; United States 111; United Kingdom 100.
Drosses, skimmings, residues, powder.	234	274	Mainly to West Germany.
Metals and alloys	79	30	United States 16; West Germany 9; Bolivia 5.

TABLE 2.—Argentina: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Nonmetals:			
Asbestos ... kilograms	----------	291	All to Chile.
Barite	636	26	Paraguay 21; Chile 5.
Borates	3,573	5,410	Brazil 4,244; South Viet-Nam 648; Poland 290.
Cement	293	415	Paraguay 192; Bolivia 123; Chile 100.
Clays:			
Bentonite	6,888	5,298	Brazil 2,722; Chile 1,100; Bolivia 998.
Kaolin	----------	60	Chile 40; Uruguay 20.
Common	351	88	Brazil 82.
Feldspar	----------	11	Italy 9.
Fluorspar	578	557	All to Chile.
Granite	1,729	4,064	Italy 3,943.
Gypsum	3,961	8,370	Uruguay 7,910; Paraguay 459.
Lime	844	394	Bolivia 393.
Marble	122	89	United States 20; Paraguay 19; Japan 11.
Mica	295	484	Italy 310; United States 118; Mexico 47.
Onyx	5	46	West Germany 31; Belgium 11.
Quartz	5	1	All to Italy.
Salt, common	37,795	57,404	Uruguay 40,214; Paraguay 17,163.
Sulfur	2	----------	
Volcanic glass (obsidian)	10	----------	
Other nonmetals, n.e.s	3,441	4,109	Paraguay 3,235; Chile 775.
Mineral fuels:			
Coke	----------	30	Brazil 25; Paraguay 5.
Asphaltite (raphaelite)	724	841	United Kingdom 336; Brazil 187; West Germany 185.
Natural gas	99,616	15,592	Brazil 15,084.
Natural gas liquids	(1)	3,039	Brazil 3,007.
Petroleum:			
Crude	254,406	101,869	All to Panama.
Refinery products:			
Gasoline thousand 42-gallon barrels	168	405	Brazil 317; Paraguay 84.
Kerosine ... do	195	59	All to Uruguay.
Distillate fuel oil	108	34,210	Uruguay 33,993; Paraguay 216.
Residual fuel oil	495,855	619,960	Canada 451,935; United States 58,159; Peru 46,371.
Lubricants, including greases	24	49	Bolivia 30; Uruguay 15.
Asphalt	1,111	3,324	Paraguay 3,303.
Other	463	818	Brazil 650; Chile 75; Uruguay 68.

Source: Dirección Nacional de Estadística y Censos, Secretaría de Estado de Hacienda. Comercio Exterior, Años 1962, 1963. Buenos Aires, 1963 and 1964.

TABLE 3.—Argentina: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Bauxite	26,469	4,292	Jamaica and/or British Guiana 2,880; Brazil 1,300.
Metal:			
Ingots and bars	15,497	15,024	United States 5,309; France 4,127; Canada 3,602.
Plates, sheets, and powder	33	17	United States 12; West Germany 3.
Antimony:			
Ore and concentrate	562	376	Bolivia 250; Peru 111; mainland China 15.
Regulus	(1)	(1)	
Arsenic, white	793	404	Sweden 245; West Germany 119; Belgium 31.
Bismuth metal and compounds-kilograms.	5,174	2,545	United States 893; West Germany 810; Peru 579.
Cadmium and salts	2	1	Mainly from United States.
Chromium and compounds	2	1	Mainly from United Kingdom.
Cobalt:			
Metal	15	22	Belgium 21.
Compounds	[r]15	12	Mainly from Belgium
Copper:			
Ingots:			
Electrolytic	17,453	15,898	Chile 6,208; Federation of Rhodesia and Nyasaland 5,277; West Germany 2,502.
Other, including alloys	1,752	1,110	Chile 900; Italy 207.
Semimanufactures including alloys	332	90	United States 28 West Germany 17 Italy 17.
Gold foil troy ounces	3,440	----------	
Iron and steel:			
Iron ore thousand tons	515	757	Brazil 342; Peru 217; Chile 198.
Scrap	71	9,343	Mainly from United States.
Pig iron, including silicon pig iron	12,946	211	Italy 91; France 73; Norway 35.
Ferroalloys	1,176	181	Republic of South Africa 160.
Billets, blooms, and slabs	275,173	82,449	Sweden 21,939; West Germany 17,228; Rumania 14,104.
Semimanufactures:			
Bars, plates and sheets, uncoated.	450,020	156,681	United Kingdom 30,994; Luxembourg 26,106; West Germany 23,353.
Galvanized plates and sheets	268	156	United States 134.
Tinplate	88,136	94,411	United Kingdom 46,283; United States 16,179; Canada 13,866.
Hoops and strips	3,068	3,939	West Germany 1,737; Japan 479; Sweden 389.
Sections	14,580	6,162	West Germany 4,545; United Kingdom 528; Belgium 496.
Rods	8,310	2,116	United Kingdom 895; West Germany 669; Luxembourg 168.
Wire	352	2,594	Belgium 2,492.
Pipes and tubes	67,296	137,100	Italy 125,785; United States 4,840; Japan 2,475.
Rails and railway track material.	4,864	1,197	Sweden 1,000.
Other	1,128	1,033	United Kingdom 448; Belgium 145 United States 140.
Total	638,022	405,389	
Lead:			
Ingots and bars	821	3	Mainly from Mexico.
Semimanufactures, except bars	2	(1)	
Mercury 76-pound flasks	320	17	Mexico 13; Chile 3.
Nickel:			
Ingots and equivalent forms	63	74	Canada 59; United States 12.
Other	138	129	Canada 56; United States 38.
Selenium	6	----------	
Tin: Bars and ingots long tons	954	1,189	Malaysia 1,148.
Zinc:			
Ingots and bars	85	435	Republic of the Congo (Léopoldville) 225; Belgium 210.
Sheets and plates	143	64	Belgium 28; United States 28.
Metallic ores, n.e.s	812	924	Australia 753.
Metals, n.e.s	137	70	United States 37.
Nonferrous alloys, unmanufactured forms, types not specified.	568	366	West Germany 329.

See footnotes at end of table.

TABLE 3.—Argentina: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals:			
Barite	[r]342	16	West Germany 10; Belgium 5.
Cement	[r]3,908	3	West Germany 170; Paraguay 100.
Chalk	27	59	France 21; Belgium 20; United States 17.
Clays:			
Foundry mold earth	2,602	17,005	Mainly from Uruguay.
Kaolin	5,416	6,456	United States 5,380; United Kingdom 995.
Other earths	51	15	Mainly from West Germany.
Diamond, industrial:			
Stones carats	17,895	1,430	United States 705; Switzerland 255.
Powder do	10,000	2,775	Mainly from United States.
Emery	1,470	1,116	France 439; West Germany 335; Brazil 116.
Graphite	121	210	United States 87; West Germany 68; Norway 35.
Gypsum	23	48	West Germany 29; United Kingdom 10; United States 9.
Kyanite	27	51	All from India.
Lithium and its compounds	25	4	Brazil 2; United States 1; West Germany 1.
Magnesite	2,762	2,405	Austria 1,161; United States 635; Brazil 314.
Marble:			
Slabs square meters	4,422	1,219	All from Italy.
Blocks cubic meters	8,997	833	Italy 825.
Mica	18	13	United States 7; United Kingdom 6.
Nitrates:			
Potassium	2	----------	
Sodium	14,011	10,000	Chile 9,950.
Pumice	1	----------	
Salt	2	2	All from United Kingdom.
Sand thousand tons	[r]521	500	All from Uruguay.
Stone:			
For construction cubic meters	5,098	----------	
For construction thousand tons	105	221	Paraguay 148; Uruguay 73.
Sulfur	24,311	13,976	United States 6,763; France 7,188; United Kingdom 20.
Talc	75	71	France 40; Mainland China 20; United States 7.
Nonmetals, n.e.s	7,270	7,173	Brazil 6,700; United States 457.
Mineral fuels:			
Coal	611,787	768,940	United States 747,451; West Germany 11,439; Poland 10,050.
Coke	22,616	1,916	All from United Kingdom.
Petroleum:			
Crude thousand 42-gallon barrels	[r]1,115	869	Venezuela 660; Bolivia 103.
Refinery products:			
Liquefied petroleum gas	51,633	31,718	Chile 21,216; France 7,134; Uruguay 3,368.
Gasoline thousand 42-gallon barrels	437	297	Mainly from Netherlands Antilles.
Kerosine do	2,582	241	Panama 152; Netherlands Antilles 89
Distillate fuel oil	961	460,831	Netherlands Antilles 230,427; Venezuela 105,831; Panama 80,564.
Residual fuel oil	316	----------	
Lubricants, including greases	111,792	73,582	Venezuela 39,224; United States 28,276; Netherlands Antilles 5,547.
Asphalt	172	173	Mainly from United States.
Other thousand 42-gallon barrels	(1)	(1)	

[r] Revised.
[1] Less than one-half unit.

Source: Direccion Nacional de Estadística y Censos, Secretaría de Estado de Hacienda. Comercio Exterior, Años 1962, 1963. Buenos Aires, 1963 and 1964.

COMMODITY REVIEW

METALS

Aluminum.—The Argentine 5-year development plan for minerals, made public late in 1964, included plans for erection of a facility to extract aluminum, iron, and titanium concentrates from lateritic clays found in Missiones Province. The installation reportedly will use a new process termed the CSIRO process (named after the Commonwealth Scientific Industrial Research Organization, an Australian Government organization which tested the method). Press reports indicate that the first license for the process was granted to an Argentine firm, Alprocsiro Argentine S.A. and that this firm's plans call for a facility with an estimated construction cost of $50 million to produce annually 62,000 tons of refined alumina, 47,000 tons of 80 percent iron oxide, and 7,000 tons of titanium dioxide. The economic practicality of this process, however, remained to be proven at yearend; tests performed up to that time were very limited scale laboratory experiments.

No recent information has been obtained on the financing and construction of three alumina reduction facilities proposed during 1961 and 1962: A 22,000-ton-per-year facility proposed by Kaiser Aluminum & Chemical Corp. at Puerto Madryn, Chubut Province; a 22,700-ton-per-year facility proposed by Reynolds International Inc. (of Panama) for erection at either Puerto Madryn or Comodoro Rivadavia; and a 10,000-ton-per-year installation proposed by Industrias Siderúrgicas Grassi S.A. in Southern Mendoza Province. All of these facilities were to be erected in Patagónia because of special benefits offered to firms establishing certain industries there. The Reynolds proposal also outlined the possible expansion of the facility by 22,700 tons per year if and when aluminum demand should reach a satisfactory level.

Beryl.—Output of beryl in Argentina declined in 1964 as the price and demand for imports in the United States (Argentina's foremost customer in previous years) remained low.

Copper.—Preliminary production data indicate that 6,560 tons of ore were mined and processed in 1964 to yield concentrates containing 345 metric tons of copper. Exports of concentrates declined to 1,312 tons in 1964. This production and export was apparently all derived from operations that were in existence prior to 1964.

Preliminary reports on the progress of the United Nations-Argentine Government $3 million program of aerial mapping and geological studies initiated in 1963 and covering the entirety of Mendoza and Neuquén Provinces and a part of San Juan Province indicate that over 20 areas were found in Mendoza Province alone with indications of copper mineralization. More detailed ground study of such areas was scheduled under the overall program which was slated for conclusion in mid–1967.

Elsewhere, the Mineral Department of the Province of San Juan reportedly discovered a promising area comprising about 6 square kilometers in the Andes foothills about 30 kilometers from the town of Barnal and was proceeding with further reconnaissance studies and testing to determine economic potential. Also, a copper deposit, described only as "large," was reportedly found in Santa Cruz Province, about 300 kilometers southwest of Comodoro Rivadavia and near the Atlantic coast. Ore from this area was reportedly being tested at yearend.

Iron Ore.—Argentina continued to depend heavily on imported iron ore in 1964 to meet requirements of its steel industry. Imports were 35 percent higher than in 1963 and totaled 1,019,116 tons. Domestic production, again obtained chiefly from the Zapla deposit in Jujuy Province, was increased by only about 1,000 tons over the 1963 level and was over 44,000 tons less than the record output level of 1961 as a result of the inability of the Argentine product to compete with imported ore.

Study of the Sierra Grande deposit in Río Negro Province continued and a publication and map on this area was released by the Argentine Government[3] indicating measured reserves totaling 36.9 million, to 38.9 million tons of ore, averaging 55.6 percent iron, 1.2 percent phosphorus, 0.4 percent sulfur, and 6.2 percent silica. Other sources have indicated unmeasured reserves of the order of 200 million tons. Successful exploitation of this deposit could greatly reduce iron ore import requirements, making possible a significant foreign exchange saving.

Iron and Steel.—Primary steelmakers in Argentina operated at near maximum economic capacity rates during 1964 in response to domestic market demand that was strengthened by the country's general recovery from the 1962–63 recession. Pig iron output exceeded that of 1963 by almost 39 percent; of the total, 547,000 tons came from the single-blast furnace of Sociedad Mixta Siderúrgica Argentina (SOMISA) at the San Nicolas steel plant in Buenos Aires Province. The balance of total output was from Establecimiento Altos Hornos de Zapla at Palpolá in Jujuy Province, a facility owned by the Government agency, Fabricaciones Militares. The nation's only other pig iron producing company, Altos Hornos Güemes in Santa Fe Province, which began operations in 1963, did not continue production in 1964 because of financial difficulties. Pig iron production fell somewhat short of total rated annual capacity, chiefly as a result of a shutdown of the SOMISA furnace from late October until early December for emergency repairs and because the Zapla facility operated at considerably less than capacity for most of the year.

Of the total pig iron output, 560,000 tons was used for steelmaking, including 531,600 tons produced by SOMISA and 28,400 tons produced by Zapla; 15,400 tons of pig iron produced by SOMISA was used directly for production of cast products and 14,000 tons of pig iron produced by Zapla was for foundry stocks.

Crude steel production exceeded that of 1963 by 37 percent; of the total, SOMISA provided 746,300 tons and Zapla, producing steel for the first time, supplied 36,000 tons. SOMISA reportedly fell short of its own goal of 850,000 tons for 1964 as a result of problems in labor relations, pig iron shortage (due to the blast furnace shutdown), and unspecified technical difficulties.

---

[3] de Alba, Enrique. Descripcion geologica de la hoja 41j—Sierra Grande (Provincia de Rio Negro). Ministerio de Economia de la Nación, Secretaría de Industria y Mineria, Subsecretaría de Mineria Dirección Nacional de Geologica y Mineria. Buenos Aires, Boletin No. 97, 1964, 67 pp.

Of total ingot steel produced, 855,000 tons was rolled into primary forms (billets and slabs) for further processing, while the greater part, if not all of the remaining 410,000 tons, apparently was used directly in the production of semimanufactures (bars, rods, structurals, pipes, sheets, etc.).

Output of every class of semimanufacture reported increased in 1964 compared with that of 1963, the increase varying from the relatively modest gain of about 14 percent for hot strip to 201 percent for hot-rolled sheet. This latter increase was chiefly the result of the major expansion of sheet production facilities at SOMISA's San Nicolas plant, an expansion aimed at capturing a market heretofore supplied largely through imports.

Argentine requirements for steel semimanufactures were estimated at about 1.75 million tons in 1964; to produce this quantity of semimanufactures about 2.24 million tons of ingot steel was needed, about 690,000 tons more than the rated annual ingot capacity of the industry at yearend 1964.

Notable changes in operating facilities during 1964 included the commencement of operations of various parts of the integrated Zapla steel plant between February and August. Pig iron had been produced here for a number of years, but other facilities, including steel furnaces and rolling mills, all completed by 1963, were not placed in operation when completed, apparently because of poor market conditions. A sintering plant was installed at Zapla in 1964 to treat the high-phosphorus ores used by the plant. Another facility inaugurated during 1964 was a new, fully automated rolling mill owned by the firm Gurmendi, at Avellaneda, in Buenos Aires Province, which apparently raised the firm's annual rolling capacity to 240,000 tons.

Among development plans aimed at further expansion of the Argentine steel industry were major additions to two private sector facilities and to the mixed public sector-private sector SOMISA operation. These projects, together with others of lesser importance, were to be considered by a special commission composed of representatives of the Ministry of Defense, the President of the Central Bank, the Technical Secretary of the National Development Council, the Director of Fabricaciones Militares, and the President of the Industrial Bank, according to a statement by the Argentine Minister of Defense in a press conference on December 9. The commission was to establish priorities for construction of the various proposed facilities but it was clearly indicated at the conference that the expansion of the SOMISA works was to be given preference over the other projects reportedly because the SOMISA program would provide the most economical means of adding 1 million-ton capacity in the shortest possible time. Officials present at the conference indicated that the Government felt that it would be able to give credit guarantees for both major private sector plant expansions, and that they both should eventually be carried out, but that one or the other would be given priority. The SOMISA plan, aimed at better balance of various processing stages and expanded overall output, called for the eventual erection of at least one more blast furnace, introduction of oxygen steelmaking facilities, provision of additional blooming facilities, and acquisition of additional mill equipment. Certain elements of this program, notably the introduction of oxygen blasting in open-hearth furnaces, were expected to be under way in 1965, but other elements were expected to be delayed for a time.

The development program of the private firm Industria Argentina de Aceros, S.A. (ACINDAR), involved establishment of blast-furnace capacity of 500,000 tons per year and of open-hearth capacity of 650,000 tons annually, thereby integrating the firm's facilities and making it fully able to meet its rolling-mill feed requirements.

The other major private sector plan, advanced by a new firm, Propulsora Siderúrgica, called for the erection of facilities with annual capacity of 1.4 million tons of pig iron, 1.3 million tons of ingot steel, and 1.1 million tons of steel semimanufactures for rerolling.

Lead and Zinc.—As a result of declining output and increased domestic demand for both lead and zinc, exports of lead concentrates were nil in 1964 and those of zinc, both as metal and in concentrates, declined to 1,081 tons and 29,855 tons, respectively. Despite the decline in production, lead and zinc remained the most important metallic minerals produced in Argentina from indigenous ores, together accounting for over three-fourths of the value of metallic mineral production in 1964.

Cía. Minera Aguilar, a subsidiary of St. Joseph Lead Co., continued as the dominant Argentine lead-zinc producer, its entire output coming from its Aguilar mine in Jujuy Province, while Cía. Minera Castaño Viejo, a subsidiary of National Lead Co., continued to rank as the second largest producer despite the declining ore reserve at the company's single property, the Castaño Viejo mine in San Juan Province, which apparently necessitated a cutback in the level of output. No details were available on less important producers.

Manganese.—Argentine manganese output increased 28 percent over that of 1963 and presumably continued to come from Santiago de Estero and Córdoba Provinces. Through yearend, the Farallon Negro (or Aqua de Dionisio) manganese deposit in Catamarca Province remained essentially unexploited. According to various sources, this deposit contains from 200,000 to more than 1 million tons of ore, averaging about 18 percent manganese dioxide (MnO_2). Unverified reports also indicate the presence of precious metal values as high as 10 to 12 ounces of gold and 200 ounces of silver per ton in this ore. The controlling entity, Yacimientos Mineros de Aqua de Dionisio (YMAD), called a public auction for mining rights to the deposit and 30 propositions were submitted of which 20 were from non-Argentine firms, including four from U.S. organizations.

Tungsten.—Output of tungsten continued to dwindle as world prices remained relatively low and no effort was made to reestablish Government subsidies.

Uranium.—Expanded production of uranium ores and the expanded extraction rate for U_3O_8 recorded for 1964 presumably reflected increased research activities of the Comisión de Energía Atómica, an organization rated by some as the most outstanding technical group in Argentina.

NONMETALS

Cement.—Despite an increase of 11.8 percent in cement output between 1963 and 1964, the Argentine industry was still operating at only about 63 percent of capacity. In mid-1964, there were still 7 private companies with 13 plants and 1 government-owned plant in Argentina. These facilities and their rated capacities were listed on page 194 of the Minerals Yearbook 1963, volume IV, Area Reports: International.

Fertilizer Materials.—During the 1963–64 crop year (July 31 to June 30), a total of 114,253 tons of fertilizer materials were marketed in Argentina, almost double the tonnage sold in the previous crop year. The plant nutrient content of these fertilizers was as follows:

Nutrient	Crop year (metric tons)	
	1962–63	1963–64
Nitrogen (N)	8,551	22,116
Phosphate (P_2O_5)	2,576	6,736
Potash (K_2O)	2,230	5,009
Total	13,357	33,861

Sizable increases in fertilizer sales were attributed to a growing awareness by farmers of the benefits from fertilizer use, coupled with the improved financial situation of the farmers as a result of better crop sale conditions and lower fertilizer costs due to elimination of high import surcharges and a sales tax. Nevertheless, fertilizer consumption in Argentina remained insignificant with respect to the total land area under cultivation. Elimination of the import surcharges and sales tax in mid–1963 were a part of an overall government program to increase crop and livestock yields (through improved pasturage); other aspects of the Government program, carried out by the Instituto Nacional de Tecnología Agropecuaria (INTA), included education and demonstration projects in rural areas.

A forecast by the Instituto de Suelos y Agrotécnica indicated a demand for 145,600 tons of contained nutrients (including 80,500 tons of nitrogen, 52,500 tons of phosphate, and 12,600 tons of potash), presuming that fertilizers can be made available at economic prices and provided that additional technical assistance can be given to farmers.

The bulk of requirements during 1963–64 were met through imports as shown in the following table, which compares gross weight of recorded sales with that of imports.

Commodity	1963–64 (metric tons)	
	Marketed	Imports
Nitrogenous:		
Ammonium chloride	200	165
Ammonium-calcium nitrate	809	2,501
Sodium nitrate	5,742	4,762
Ammonium nitro sulfate	8,656	8,941
Ammonium sulfate	36,436	38,057
Urea	14,847	21,625
Total	66,690	76,051
Phosphatic:		
Thomas slag	1,096	100
Triple superphosphate	1,154	1,821
Total	2,250	1,921
Potassic:		
Potassium chloride	725	1,825
Potassium sulfate	1,374	540
Total	2,099	2,365
Mixed:		
Potassium nitrate	1,550	160
Phosphatic-nitrogenous	5,530	3,188
Nitrogenous-phosphatic-potassic	14,050	22,927
Total	21,130	26,275
Other	22,084	--------
Grand total	114,253	106,612

Domestic production was confined to 6,000 tons of ammonium sulfate, 271 tons of marine bird guano, and an unreported quantity of mixed fertilizers of which 21,813 tons was marketed.

An increase in domestic supply is slated for 1967 when the first stages of a petrochemical plant at Campana are scheduled for completion. This facility reportedly will have the following annual capacities:

	Metric tons
Ammonia	55,000
Urea	55,000
Sulfuric acid	39,900
Ammonium sulfate	50,000
Compound fertilizers	30,000

Salt.—The sharp decline in salt production in 1963 was the result of unfavorable climatic conditions for solar evaporation in the landlocked lakes of the Provinces of La Pampa, San Luis, Buenos Aires, and Córdoba. Improvement in output in 1964 was attributed to a return to more normal conditions.

MINERAL FUELS

Coal.—Argentina's only significant coal resources occur in the Río Turbio area in the remote southwest corner of Santa Cruz Province. Río Turbio deposits contain an estimated 300 to 400 million tons of low-caloric, high-ash content (up to 18 percent) bituminous coal.

The Government-owned agency Yacimientos Carboníferos Fiscales (YCF) operated all coal mines, employing nearly 2,800 persons. In 1964, YCF increased output of washed coal by 60 percent over that of 1963 and supplied 30 percent of the country's total coal consumption of 1.1 million metric tons. As in recent years, YCF continued to sustain heavy losses as a result of the high costs of transporting coal from Río Turbio some 240 kilometers by rail to the coast and 2,400 kilometers by sea to the industrial consuming area of Buenos Aires. Late in 1964, YCF announced plans to further expand output and improve transportation facilities. Plans include improved port facilities at Río Gallegos, purchase of three ore vessels, and use of highly mechanized mining equipment to expand coal production ultimately to 1 million tons annually. These actions are essential to lowering the unit cost of coal delivered to consumer markets at a price level competitive with imported coal.

Late in 1964, YCF and Carbonífero Loto-Schwager (a privately owned coal mining company in Chile) agreed to exchange technical and other information of mutual benefit to their operations.

Petroleum.—The most significant oil industry developments in 1964 were: A sharp increase in demand for crude oil and refinery products; a sharp decline in the rate of petroleum exploration and oilfield development; continued efforts by the Government and private oil companies to settle problems created by the Government's decree of annulments of oil exploration and development contracts of November 1963; and an even more pronounced increased inability of the domestic industry to supply Argentina's oil needs.

Argentina's proved crude oil reserves were estimated[4] to be about 2,000 million barrels as of December 31, 1964, located chiefly in the oilfields of the southern Provinces of Chubut, Santa Cruz, and Tierra del Fuego; the west-central Provinces of Mendoza, Neuquén, and Río Negro; and the northern Province of Salta.

In 1964, demand for crude oil and refinery products reached a new peak of 119.7 million barrels, an increase of 11.7 percent over that of 1963, while domestic crude oil production, at 100.4 million barrels in 1964, increased only 3.2 percent. As a result, imports of crude oil and refinery products valued at $72 million were required to meet demand. Petroleum exports, consisting mainly of excess fuel oil, were valued at $5.6 million in 1964.

The Government of Argentina and eight private oil companies holding oil exploration and development contracts with Yacimientos Petrolíferos Fiscales (YPF), the Government-owned oil entity, continued throughout 1964 to seek settlements to problems raised by the Government's unilateral contract annulment decree of October 1963. In November, a financial settlement with Astra, an Argentine contractor, was concluded and YPF assumed operations of the company; other private firms continued possession of oil installations and produced oil for YPF, accounting for about 30 percent of output.

Although YPF announced several new oil discoveries in 1964, no large fields were reported. Oilfield exploration and development well drilling declined sharply. In 1964, total footage drilled was 2,982,000, a decrease of 33 percent from the footage drilled in 1963. Also, the number of well completions was about 37 percent less in 1964 than in 1963. Wells completed during 1964 were as follows:

	Drilled by YPF	Drilled by contractors	Total
Type of wells:			
Exploration	55	3	58
Outpost	112		112
Production	241	88	329
Total	408	91	499

Argentina's 16 oil refineries, having a crude oil processing capacity of about 370,000 barrels per day, operated at 81 percent of capacity during 1964. A contract for modernization of YPF's refinery at La Plata was awarded to the Japan Gasoline Company.

Natural Gas.—During 1964, a new 1,100-mile, 30-inch-diameter natural gas pipeline from YPF's southern oilfields in Santa Cruz to Buenos Aires was essentially completed. The Italian firm, Societa Azionaria Italiana Perforazioni e Montaggi (SAIPEM), financed and constructed the $300 million project for Gas del Estado, the Government-owned gas entity. Late in 1964, the line was placed in partial operation, delivering up to 60 million cubic feet of gas per day to several cities between Pico Truncado and Tandil. Upon completion of field gathering and compression facilities, the capacity of the pipeline will be about 175 million cubic feet per day.

---

[4] Oil and Gas Journal. V. 62, No. 52, Dec. 28, 1964, p. 106.

The Mineral Industry of Bolivia

By Frank E. Noe[1]

◆

IN 1964 the gross (f.o.b.) value of Bolivian mineral exports, indicative of approximate value of production, was placed at $107.9 million[2] by the Bolivian Ministry of Mines and Petroleum. This represented roughly a 34-percent increase over the 1963 value. Tin continued to be by far the most valuable export, accounting for 75 percent of the total value of 1964 mineral exports; tin was followed in descending order of value by silver, antimony, lead, copper, zinc, gold, and tungsten. The mineral industry accounted for approximately 95 percent of the value of all Bolivian exports, continuing the gradual increase from 1960, when minerals were responsible for 88 percent of total exports. The relatively large increase of gross value of 1964 exports over that of 1963 was due largely to higher metal prices in 1964; total weight of principal metal exports increased only 12.5 percent during the year.

While increases were registered in the production of tin, antimony, silver-zinc, bismuth, copper, and sulfur, decreases were noted in the production of lead and tungsten. Bolivia continued to rank third in the world production of antimony and tin in concentrate and fourth in bismuth. It maintained its position as the principal Western Hemisphere producer of tin and antimony and ranked highly in the production of tungsten, bismuth, gold, silver, and sulfur.

The mining industry contributed about 9 percent to the gross domestic product (GDP) of $435.2 million (figures in constant 1958 dollars), a 4 percent increase compared to the 1963 contribution. During the same period the petroleum industry was estimated to have contributed $17.5 million (4 percent) to the GDP, an increase of 4.8 percent over the 1963 level. The contribution of petroleum to the total export value in 1964 is not yet available, but it was undoubtedly considerably less than the $2,256,000 value of crude petroleum exports in 1963, because of increased consumption of crude petroleum by domestic refineries. It is estimated that in 1964 Bolivian metal mining employed approximately 45,000 workers, slightly more than 5 percent of the total labor force. Approximately 5,000 additional workers were employed in the petroleum industry.

---

[1] Latin America specialist, Division of International Activities.

[2] Where necessary, values have been converted from the peso (B$) at the rate of B$12 equals US$1.

In 1964 the Bolivian Mining Corp. (COMIBOL), the nationalized sector of Bolivia's mining industry, accounted for approximately 47 percent of the tonnage and 64 percent of the gross value of metals exported, while the private mining sector, divided by the Government into medium and small mines, accounted for 53 percent of the tonnage and 36 percent of the value. During the year the medium mines division of the private sector recorded the greatest gain, 51.7 percent in weight of metals exported and 68.3 percent in gross value of metals exported. This gain is attributed chiefly to private initiative and to the availability of capital, which enabled the medium miners to take advantage of higher metal prices by increasing production. Small private mines, legally required to sell their production through the Banco Minero, made little or no gain in exports in 1964. The use of export data as a measure of production in this case, however, is misleading because various cooperatives and small mines have sold their production to COMIBOL, whose purchase of tin from outside sources in 1964 was 6,477 metric tons, an increase of 1,500 tons over 1963 purchases. Such purchases, reported officially as having been produced by COMIBOL, accounted for 36.6 percent of COMIBOL's total 1964 production.

TABLE 1.—Bolivia: Distribution of principal[1] metal exports by group

(Metric tons of fine metal)

	1962	1963	1964
Total weight of principal metal exports	55,067	60,285	67,840
Percent increase from previous year	----------	9.5	12.5
COMIBOL, total weight of principal metal exports	27,152	30,742	31,817
Percent increase from previous year	----------	13.2	3.5
Percent of country total	49.3	51.0	46.9
Medium mines (direct export), total weight of principal metal exports	9,597	11,317	17,165
Percent increase from previous year	----------	17.9	51.7
Percent of country total	17.4	18.8	25.3
Small mines (export through Banco Minero), total weight of principal metal exports	18,318	18,226	18,858
Percent increase from previous year	----------	----------	3.5
Percent of country total	33.3	30.2	27.8

[1] Tin, lead, zinc, antimony, copper, tungsten, bismuth, and silver.

TABLE 2.—Bolivia: Gross (f.o.b.) value of mineral exports by group

(Millions U.S. dollars)

	1962	1963	1964
Total mineral export value	70.2	80.5	107.9
Increase from previous year percent	2.2	14.7	34.0
COMIBOL, total mineral export value	44.6	49.4	68.8
Increase from previous year percent	----------	10.8	39.2
Share of total do	63.5	61.9	63.8
Medium mines (direct export), total mineral export value	11.2	12.7	21.3
Increase from previous year percent	----------	12.8	68.3
Share of total do	16.0	16.1	19.7
Small mines (export through Banco Minero), total mineral export value	14.4	17.8	17.8
Increase from previous year percent	----------	23.3	----------
Share of total do	20.5	22.2	16.5

GOVERNMENT POLICIES AND PROGRAMS

Government policies and programs during the year were profoundly influenced by two events, one economic and the other political. Early in the year the second phase of Operation Triangular for the rehabilitation of COMIBOL was completed, and the corporation submitted an application for an additional loan of approximately $18 million to implement the third phase of the operation. The financing partners (The Inter-American Development Bank, The Federal Republic of Germany, and the U.S. Government) of Operation Triangular appointed a COMIBOL review group to examine and evaluate the results of the first and second phases of the operation and to make recommendations concerning the advisability and financial requirements for a third phase. The group met in Bolivia during September but disbanded without making final recommendations, because they were not able to actually visit the mines and personally verify accomplishments and ore reserves reported by the COMIBOL management. This was due to labor unrest at the mines in the course of which several of the engineering members of the group were forced to leave Colquiri and Catavi by hostile miners. No additional meetings of the review group were held in 1964, and as a result no third phase loans were made.

The event, however, which affected government policies the most was the overthrow of President Paz Estenssoro by the Armed Forces on November 3d and 4th. Control of the Government was taken by a military junta, and military officers were placed in charge of the various government departments. The U.S. Government did not recognize the junta until December 8th, and during the interim period all U.S. Agency for International Development (AID) programs were suspended, except those having basically humanitarian objectives. Businessmen and industrialists throughout the country were generally hopeful that the junta and its successor government would be more favorably inclined toward private business than the Paz regime, which had been strongly oriented to State control of many sectors of the economy. Domestic and foreign investors generally went ahead with investment decisions taken before November, but in the mining sector most potential investors adopted a wait-and-see attitude pending an expression by the junta of a policy for the mineral industry. While the President of the junta and his Minister of Economy made frequent statements about the need for increased private investments and talked about promulgating a new investment law which would give tax advantages to private enterprise, actions of the Ministry of Mines and COMIBOL continued to favor the maintenance and expansion of government activity in mining and to discourage private investment.

During the year COMIBOL continued to operate at a loss. The provisional 1964 loss figure of $6 million is likely to be increased to about $8 million because of accounting adjustments. There was no evidence of progress by COMIBOL and the Government of Bolivia in reducing production costs and in restoring effective management authority to the mines. As a result of the unwillingness of the Paz Estenssoro Government to take a firm stand on the question of labor discipline at the mines, it has been reported that more than 25 top level management and technical personnel (managers, superintendents, and foremen) were forced out of the mines by union threats and pressures during 1963 and 1964. At yearend the junta had initiated steps to improve management practices at the mines, and the Government was investigating the financial situation of the corporation as a whole and the alleged mismanagement of funds by the preceding COMIBOL administrators.

During the year negotiations were continued between AID and the Banco Minero de Bolivia for a $5 million development loan. Prior to the revolution very little progress was made in reorganization of the bank because political pressures nullified efforts to accomplish the basic changes deemed necessary for its rehabilitation. Bolivian and U.S. experts submitted a draft mining code to the Government who referred it to the Ministry of Mines for study. It had been expected that the code would be presented to the Congress in August for approval, but at yearend it was being revised for presentation to the junta for approval. An article of the proposed code called for the elimination of the requirement that small miners must sell their ore to the Banco Minero. Previous attempts to eliminate this monopoly were unsuccessful. At yearend the Banco Minero was buying ore from 2,200 small mines, a sharp increase from the 1,691 mines selling ore to the bank during August. There also appeared to be ample evidence that COMIBOL was continuing to buy substantial amounts of tin ore from the small miners in contradiction of the Banco Minero's monopoly right to such purchases.

Supreme Decree No. 06717 of March 25 lowered mineral export taxes an average of about 30 percent. Previously they averaged about 60 percent of the ore value. If the world price of tin is $1 per pound or less, no export taxes are to be charged the exporter regardless of the grade of concentrate shipped. The previous minimum figure was $0.80 per pound. A 10-percent concentrate at a world price of $1.15 per pound of tin is charged 3.5 percent of the gross value; at a world price of $1.30, 5.0 percent; and at a world price of $1.45, 6.5 percent. For tin concentrate running 40 percent or higher at a world price of $1.15 per pound, 8.5 percent of the gross value is charged; at a world price of $1.30, 15.2 percent; and at a world price of $1.45 or more, 20 percent. This new decree is much more logical economically than the old one because it does not punish efficient concentration methods. Previously, the higher the concentrate grade, the higher the export tax, and this caused the miner to dilute his high-grade concentrate with sand, but under the new system, taxes for low-grade complex ores are even higher than before. This, however, presented a problem for the medium miners, who are the main exporters of this type of ore. At yearend a new system for export taxes was being studied whereby the tax would be calculated only on the base of value and not by arbitrary charges on grade percent content.

The National Department of Geology (DNG) continued its field activities during the year. The joint exploration program between the DNG and the United Nations terminated in July, while the joint program of the DNG and AID continued throughout the year. During 1964 the DNG gave technical assistance to 81 private mines, compared with 64 during 1963. About 20 percent of the assisted mines reopened during the year or were preparing to reopen. A report on the preliminary gold exploration in the area comprised by the Chayanta, Tipuani, Yuyo, and Tuichi Rivers was published and aroused worldwide interest. Nearly every river sampled contained significant amounts of gold and platinum-group metals. Diamonds were reported in several places in the region but not identified in samples taken by the DNG.

Geologic maps of the Rio Blanco, Charana, and Santiago de Machaca quadrangles were printed and available for distribution. The three maps cover the area along the Chilean border west of La Paz, including the Berenguela district which is a potentially large producer of cadmium, lead, zinc, copper, and silver. A total of 17 geologic quadrangle maps have now been published. Approximately 36,000 square kilometers of field geologic mapping was completed in the Departments of Oruro, La Paz, Potosí, and Chuquisaca. The geology will be compiled on planimetric base maps. A new book [3] on deposits of minerals and hydrocarbons was completed and published and is available from the Ministry of Mines and Petroleum.

A joint project between Bolivia and the United Nations made little or no progress towards the creation of a national Institute of Mining and Metallurgical Investigations. Although it was provisionally agreed that the institute would be situated at Oruro and that COMIBOL would make its laboratory facilities available to the institute, the matter was still under discussion following the November revolution. The United Nations submitted to the Bolivian Government a proposal to spend approximately $338,000 from the special fund for exploration and cost analyses of the Mutun iron deposit in eastern Bolivia with a view towards its exploitation and marketing. This proposal was also under study at yearend.

PRODUCTION

Production statistics presented represent actual COMIBOL production plus exports by the small and medium mines and the smelters except in the case of gold. Since the exports of gold were obviously not representative of the 1964 production, a more representative figure was obtained by adding the production of South American Placers, Inc. (SAPI), purchases by the mining bank, exports of medium mines other than SAPI, and COMIBOL production.

---

[3] Ahlfeld, F., and A. Schneider-Scherbina. Los Yacimientos Minerales y de Hidrocarburos de Bolivia. (Deposits of Minerals and Hydrocarbons of Bolivia). Departamento Nacional de Geologia, Ministerio de Minas y Petróleo (La Paz, Bolivia), Boletin 5 (Especial), 1964, 388 pp.

TABLE 3.—Bolivia: Approximate production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Antimony, content of—					
Ore and concentrate	5,333	6,733	6,665	7,549	9,620
Metal [2]	10	2	---	---	---
Beryl [2]	---	60	79	---	30
Bismuth, content of ore and concentrate kilograms	186,636	227,716	303,904	r 254,410	271,000
Copper, content of ore and concentrate	2,208	2,232	2,408	3,001	4,734
Gold troy ounces	38,677	80,191	35,034	153,019	128,576
Iron ore [2]	---	---	63	---	---
Lead, content of—					
Ore and concentrate	21,301	18,937	18,484	19,041	16,493
Refined metal and solder	108	4	125	254	461
Manganese, content of ore [2]	---	48	264	---	---
Mercury [2] 76-pound flasks	---	---	11	105	[3] 32
Silver, content of concentrate thousand troy ounces	4,704	3,649	3,884	4,443	4,517
Tin, content of—					
Concentrate long tons	20,251	20,399	21,271	22,209	24,319
Refined metal, solder, dross [4] do	1,468	2,015	2,023	2,463	3,610
Tungsten concentrate 60 percent WO_3 equivalent	2,244	2,887	2,482	2,194	2,006
Zinc, content of concentrate	4,292	4,885	3,634	4,229	9,592
Nonmetals:					
Asbestos [2]	r 170	r 105	52	r 11	[3] 139
Cement thousand tons	38	45	49	r 62	64
Fluorite [2]	---	---	---	---	9
Gypsum	---	---	---	200	700
Mica [2]	---	---	7	---	---
Sulfur [2]	r 1,191	4,975	7,363	9,950	10,806
Mineral fuels:					
Natural gas million cubic feet	NA	NA	[5] 5,110	[6] 3,853	[6] 4,145
Natural gasoline barrels	NA	NA	NA	4	10
Liquid petroleum gas do	NA	NA	NA	6	---
Petroleum:					
Crude thousand 42-gallon barrels	3,574	2,989	2,917	r 3,401	3,290
Refinery products:					
Motor gasoline do	904	920	1,028	r 1,009	1,126
Kerosine do	400	399	431	404	467
Distillate fuel oil do	383	356	439	424	448
Residual fuel oil do	542	503	633	594	790
Other do	---	---	65	r 205	73
Total refinery products do	2,229	2,178	2,596	r 2,636	2,904
Refinery fuel and losses do	32	32	39	r 43	51
Total refinery throughput do	2,261	2,210	2,635	2,679	2,955

r Revised. NA Not available.

[1] COMIBOL production plus exports by small and medium mines and smelters. Figures differ slightly from those in volume I, which uses total exports as indicative of approximate production.

[2] Exported by small and medium mines.

[3] Purchases by Banco Minero.

[4] Contains unspecified amount of tin reported also in tin-in-concentrates production.

[5] Gross production.

[6] Commercial production, processed and exported.

TRADE

For the first time in many years, Bolivia had a favorable trade balance. In 1964 imports of all commodities were valued at about $102.7 million c.i.f., while exports of all commodities were valued at approximately $113.9 million f.o.b. The United States was the principal source of Bolivian imports and supplied goods valued at almost $52.9 million, or 51.45 percent of the total. The United States ranked second as a destination for Bolivian mineral exports with consignments valued at $36.9 million, equivalent to 34.2 percent. The United Kingdom was the principal recipient of Bolivian minerals, receiving exports valued at $54.8 million, or 50.8 percent of total Bolivian mineral exports. Of this amount, $52.7 million represented exports of tin and tin minerals, and $1.7 million represented gold exports. The United States was the principal destination of all other metals except antimony. Although Bolivian export statistics indicate that the United States was the principal destination for antimony exports, Japan and Western Europe were actually equally important ultimate destinations. West Germany, the Netherlands, Japan, and Belgium were also important markets for other Bolivian minerals.

TABLE 4.—Bolivia: Exports of metals and minerals[p]

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Metals:				
Antimony, content of ore and concentrate	6,651	7,563	9,640	Japan 3,139; United States 2,964.
Beryl, gross weight	79	--------	30	All to United States.
Bismuth, content of concentrate	296	280	274	United States 193; Canada 25.
Copper, content of concentrate	2,400	2,994	4,681	United States 2,379; Japan 2,173.
Gold ... troy ounces	35,052	153,034	50,043	United Kingdom 49,544.
Iron ore	63	--------	--------	
Lead, content of—				
Concentrate	NA	[r]19,432	16,597	NA.
Refined bars, solder, slag	NA	731	1,095	NA.
Total	18,601	20,163	17,692	Belgium 7,974; United States 7,037.
Mercury ... 76-pound flasks	--------	105	--------	
Silver, content of concentrate ... thousand troy ounces	3,760	4,869	4,823	United States 3,633; Netherlands 492.
Tin, content of—				
Concentrate ... long tons	19,469	[r]20,290	20,417	NA.
Refined bars, solder, dross ... do	2,023	[r]2,462	3,610	NA.
Total ... do	21,492	[r]22,752	24,027	United Kingdom 15,718; United States 5,636.
Tungsten, content of concentrate, 60 percent WO^3 equivalent.	2,539	2,281	2,073	United States 1,978.
Zinc, content of concentrate	3,648	4,648	9,758	United States 5,854; Japan 3,888.
Nonmetals:				
Asbestos	52	9	6	Argentina 4; Chile 2.
Fluorspar	--------	--------	9	All to Peru.
Gypsum	--------	200	700	All to Brazil.
Mica	7	--------	--------	
Salt	NA	350	[1]145	Do.
Sulfur	7,363	9,950	10,806	Mainly to Chile.
Mineral fuels:				
Natural gas ... million cubic feet	319	1,956	1,139	All to Argentina.
Petroleum, crude	58,159	69,310	38,480	Do.
Distillate fuel oil	25	73,656	NA	

[p] Preliminary. [r] Revised. NA Not available.

[1] First quarter only.

TABLE 5.—Bolivia: Selected imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962		1963	
	Weight	Value (U.S. dollars)	Weight	Value (U.S. dollars)
Metals:				
Aluminum, all forms	271	231,831	282	242,546
Copper, all forms	93	103,173	188	181,034
Iron and steel, all forms	21,625	6,265,969	29,393	7,511,172
Lead, all forms	7	7,677	29	14,104
Tin, alloys ... long tons	15	6,194	13	20,806
Zinc, all forms	399	81,899	172	39,172
Other nonferrous metals	4	13,431	12	13,199
Metallurgical minerals, slags, ashes	5	408	2	1,215
Nonmetals:				
Fertilizer, all types	941	92,755	2,037	204,403
Other [1]	9,625	408,244	13,507	475,776
Mineral fuels:				
Coal and coke	NA	NA	1,285	76,815
Petroleum refinery products:				
Aviation gasoline	NA	NA	12,122	880,913
Motor gasoline	NA	NA	68	12,138
Kerosine	NA	NA	84	16,223
Diesel oil	NA	NA	66	7,442
Fuel oil	NA	NA	100	9,421
Other	NA	NA	7,038	872,701
Total mineral fuels	75,361	3,589,643	20,763	1,875,653
Total:				
Value of principal metal and mineral imports	----------	10,801,224	----------	10,579,080
Value of all imports, c.i.f	----------	97,726,643	----------	103,773,528
Metals and minerals share in total imports ... percent	----------	11.1	----------	10.2

NA Not available.

[1] Salt, sulfur, gypsum, lime, cement, earths and stone, not separately identified.

Source: Ministerio de Hacienda, Dirección General de Estadística y Censos. Boletín Estadístico No 89 and enclosure, 1964.

COMMODITY REVIEW

Metals

Antimony.—Exports in 1964 rose to 9,640 metric tons of metal in concentrate valued at $5,465,000 from 7,563 tons valued at $2,537,000 in 1963, an increase of 27.5 percent in weight and 115.4 percent in value. The private mining sector accounted for practically all of the exports, with the medium mines division accounting for all of the increase. Antimony exports of the medium mines rose by 54 percent in 1964 to 6,521 metric tons. The improved production was due to the increase in price from $4.10 per 22.40-pound unit (grade B, 60 percent) in 1963 to $8.10 in 1964. The Empresa Minera Unificada, S.A. (EMUSA) maintained its position as the largest producer in the Western Hemisphere with an output of 3,876 tons. It was reported that the traditional hand-cobbing methods of concentration were being augmented by the installation of flotation equipment to increase the recovery of fine antimony and improve the overall efficiency of the operation.

Bismuth.—The Tasna mine of COMIBOL continued to be the only Bolivian bismuth producer of importance, accounting for 257 tons, or approximately 95 percent of Bolivian production in 1964.

Cadmium.—As a part of the National Department of Geology technical assistance program, geologists made a 6-day study of promising cadmium-zinc-lead-silver deposits in the Berenguela region near the Chilean border. Five important and several minor deposits were studied, and it was concluded that the district can become an important cadmium producer with moderate capital investment. Hand-sorted sulfide ore from these mines is reported to contain 2 to 5 percent cadmium. Polarographic analysis of samples resulted in discovery of 6.7 percent cadmium in oxidized lead and zinc ore on the surface. Also, as a result of DNG investigations, it was discovered that zinc concentrate from the COMIBOL Telamayu mill in the Quechisla district contains about 0.8 percent cadmium. Shattuck Denn Mining Corp. through a subsidiary, Trans-American Resources, Inc., reportedly obtained a cadmium-zinc-lead-silver property near Berenguela and was producing hand-cobbed ore while working out a flowsheet for concentration of the cadmium.

Copper.—Copper production for 1964 rose approximately 58 percent from 1963, due principally to the Japanese-owned Empresa Nitto Bolivia Mining which increased production from its Chacarilla mine by 1,380 tons to 2,485 tons, thus accounting for 81 percent of the copper production by the private sector and 52 percent of the total Bolivian production. The Corocoro mine of COMIBOL, despite an increase of 185 tons over the 1,360 tons produced in 1963, relinquished its role as the leading copper producer of Bolivia, a position it had held for more than 25 years.

Gold.—Purchases by the Banco Minero of 60,717 ounces of gold were down 24 percent from 1963, while the production of the South American Placers, Inc. (SAPI) dredge increased almost 71 percent to 67,612 ounces. Practically all Bolivian gold production came from the Alto Beni region of the northeastern part of the Department of La Paz, principally from the Tipuani and Kaka Rivers. Tipuani gold was produced by cooperatives and independent miners who sold an estimated half of their production to the Banco Minero and the rest to independent gold buyers whose purchases are presumed to go into jewelry and contraband.

The SAPI dredge worked on the Kaka River throughout the year and dredged 2,152,000 cubic yards. Fully developed reserves at the end of 1964 were measured at 28 million cubic yards containing values of 39.7 cents per yard. The company paid $669,000 in royalties and taxes to the Bolivian Government, equivalent to 28 percent of the total company revenue. A campaign of harassment alleging contract violations by SAPI was begun in the press during the last quarter of the year and reached such proportions that the company publicly announced its willingness to give up its operation if it could find a buyer. The Government appointed a commission to investigate the charges.

The National Department of Geology released a report based on 5 exploratory trips made during 1963 to study alluvial gold resources of rivers in the Beni and La Paz Departments. The Tuichi, Yuyo, Aten, and Challana Rivers were explored in some detail. The Freydanck Study, available at the Ministry of Mines and Petroleum, indicates that Bolivia could become one of the major gold-producing countries of the world. At present mining would be very costly because the gold areas are almost inaccessible. However a start has been made on construction of a road, financed by AID, to Tipuani from Caranavi, which is already connected to La Paz by a fairly good mountainous road.

Tidewater Oil Co. and the Bolivian Government signed a contract on July 23, 1964, permitting Tidewater to explore and mine 31,000 hectares of gold-bearing alluvial deposits in the Mapiri, Kaka, and Alto Beni Rivers. The contract allows Tidewater 12 months for exploration after which the company must install one dredge within 2 years and a second dredge within the next 2 years or lose all rights. Tidewater will pay a single tax, beginning at 14 percent of the gross production and increasing 1 percent each year to a maximum of 30 percent, regardless of the gold content. At the end of the year, Tidewater Placers had 4 drills exploring its Mapiri River concession.

Trans-American Resources, Inc., acquired interests in two gold properties, the Kollo lode mine in the Yungas between Coroico and Chulumani and the Atalaya placer concession on the middle Tuiche River in the Alto Beni gold region. A flotation mill was being installed at the Kollo mine.

Lead.—Lead production declined somewhat as the small miners turned their attention to more favorably priced zinc. COMIBOL production also dropped slightly. Improvement was shown only in the medium mining sector, where exports of 2,413 tons were registered. The Animas mine of COMIBOL maintained its position as the largest individual producer with an output of 3,759 tons.

Tin.—Although the gross tin production of COMIBOL increased approximately 15 percent to 17,412 long tons in 1964, it did so largely at the expense of production from small mines. Mill production rose 8 percent while COMIBOL purchases rose 29 percent. An important source of increased purchases were the cooperatives in Potosí which formerly sold their production to the Banco Minero. During 1964 Banco Minero purchases of fine tin dropped to 3,290 long tons from 3,843 in 1963, a decrease of over 14 percent.

TABLE 6.—Bolivia: Exports of tin by groups

(Long tons of contained tin)

Group	1962	1963	1964
Corporación Minera de Bolivia	13,219	[r] 13,933	14,182
Medium mines	2,731	[r] 3,223	3,462
Banco Minero (small mines)	3,521	[r] 3,134	2,772
Smelters, refined metal and solder:			
Fundición de Estaño de Oruro (Peró)	1,501	1,760	2,958
Metabol	515	702	652
Hormet (Zalesky)	5	----------	----------
Total	21,492	[r] 22,752	24,026

[r] Revised.

In 1963 COMIBOL had some success in reducing the total cost per pound of fine tin but in 1964 the cost trend by quarters was as follows (1963 costs in parentheses): First quarter—$1.22 ($1.33); second quarter—$1.36 ($1.32); third quarter—$1.44 ($1.31, excludes August because of a general strike in that month); fourth quarter—$1.52 ($1.23). The cost per pound of tin recovered from ore milled by

COMIBOL only, for 1964, the first year such cost figures were available, was $1.48 exclusive of export taxes; the average export tax on milled ore in 1964 was 25 cents per pound. In contrast, the cost per pound of fine tin in purchased concentrates for the year averaged $1.35 including export taxes. The high and increasing labor costs were attributed to labor indiscipline, resulting in low productivity and excessive personnel.

In 1964 COMIBOL employed over 25,000 workers and produced about 10,800 long tons of tin from its own facilities, and the rest of its exports came from purchased concentrates. Thus, each worker produced about 0.43 long ton of fine tin per year. Approximately 3 million long tons of ore are mined and milled by COMIBOL yearly, so that in a 300-day work year production per man per day averaged about 0.4 long ton. COMIBOL uses horizontal cut and fill stopping, shrinkage stopping, and block-caving methods of mining. In Latin America expected averages for cut and fill stoping are 5 to 7 tons per man-shift, for shrinkage stoping about 10 tons per man-shift, and for block caving about 35 to 40 tons per man-shift. These figures, however, are only for men underground. Assuming an equal number of men working outside the mine, these figures would be reduced by half but would still be considerably above the present productivity of COMIBOL labor.

TABLE 7.—COMIBOL salient statistics

	1961	1962	1963	1964
Production..........long tons..	14,598	15,000	15,134	17,412
Approximate price received per pound..........US dollars..	1.10	1.12	1.14	1.52
Production cost per pound..........do....	1.26	1.33	1.31	1.39
Approximate export tax per pound..........do....	.14	.13	.16	.25
Total export tax owed to Government of Bolivia......million US dollars..	4.6	4.3	5.5	10.0
Approximate loss, including export taxes..........do....	11.2	15.8	13.9	6.0
Number of employees on December 31..........	28,219	26,843	25,524	25,225
Total labor cost..........million US dollars..	25.9	25.5	24.6	27.2

During 1964 only 2 smelters functioned in Bolivia: Fundición de Estaño de Oruro (Peró), affiliated with COMIBOL; and Metabol owned and operated by the Banco Minero. Throughout the year there was increasing propaganda for the establishment of a local smelting industry as the solution to Bolivian problems. However, COMIBOL was unable in 1964 to deliver enough high-grade concentrate to Peró to allow it to operate at its capacity of 5,000 tons.

Trans-American Resources, Inc., the Bolivian subsidiary of Shattuck Denn Mining Corp., became actively interested in the Kelluani lode tin mine on the south side of Chacaltaya peak near La Paz. At yearend exploration was underway to determine whether the mine could support a 150-ton-per-day gravity mill.

Tungsten.—Although rising prices revived to some extent interest in tungsten mining, the market price was still too low to stimulate growth of wolfram mines in Bolivia. Production continued its downward trend as the number of producing mines declined from 69 in 1963 to 56 in 1964.

Zinc.—Bolivia's zinc production increased 126 percent and exports rose 110 percent in 1964 with the private mining sector accounting for all of the increase. Although the zinc production of the medium mines tripled during the year, purchases by the Banco Minero rose from 247 tons during 1963 to 4,583 tons in 1964. The phenomenal increase in small mine production is attributed to the opening of new zinc mines in the region east and southeast of Potosí in response to the improvement in price that began in 1963 and still had upward tendencies at yearend 1964.

Throughout 1964 COMIBOL carried on negotiations to form a mixed company to work the large Matilde zinc deposit near Lake Titicaca. A Japanese group, Overseas Mineral Resources Development Co., appeared to be in a preferred position until the November revolution. Since then the U.S. firm, Philipp Brothers, and the West German firm, Stolberger Zink, S.A., have presented serious proposals for COMIBOL consideration.

Nonmetals

Asbestos.—The A. A. Wormald Asbestos Mining Company increased production during the year at its crocidolite deposits in the Chapare region of the Department of Cochabamba. The National Department of Geology undertook an investigation of the deposits to appraise asbestos reserves and distribution. AID provided funds for a road to the mine and also granted the company a loan for expansion of milling facilities. The Banco Minero purchased 139 tons of asbestos in December.

Sulfur.—Exports increased 8.7 percent to a new high of 10,806 tons. There is no information available on domestic consumption although a small sulfuric acid chamber plant was inaugurated in La Paz in 1949 and a new contact plant began operations in Oruro in February 1964. The latter, owned by South American Chemical Co. (SAMCO), had a capacity of 8.5 metric tons of acid on a 24-hour-per-day basis.

Mineral Fuels

Natural Gas.—Commercial production of natural gas during 1964 was reported at 4,145 million cubic feet, of which 1,139 million cubic feet was exported to Argentina and 3,006 million cubic feet was processed for domestic consumption. In comparison, 1963 exports, also to Argentina, were higher at 1,956 million cubic feet while commercial production and gas processed for local consumption were lower at 3,853 and 1,897 million cubic feet, respectively. The Madrejones field of the Bolivian Oil Co. (BOC), near the Argentine border, was the source of all gas exported, while the Government-owned company, Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), drew gas from several fields for processing.

Petroleum.—During 1964 Bolivia had three producing oil companies: The state-owned petroleum entity Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), the Bolivian Oil Co. (BOC), and the Bolivian Gulf Oil Co. (BOGOC). Since 1962, BOC, the oldest of the oil companies, has been exploiting its reserves from wells previously drilled in the Madrejones field at Yacuiba on the Argentine border, but output has declined steadily. BOC exported 30,957 barrels of crude to Argentina and sold the remainder of its production to YPFB.

Bolivian Gulf was the only private oil company active in exploration during the year. BOGOC delivered about 20,000 barrels of its production to the YPFB refinery in Santa Cruz and consumed the remainder in its own operations. During the year BOGOC brought in two new gas condensate fields (Palmar and Santa Cruz) and in addition did some 32,000 meters of development drilling, bringing in 12 new wells. Total drilling by BOGOC in 1964 was 53,897 meters. Reportedly, BOGOC has 55 wells capable of producing oil or gas that were shut in awaiting pipeline outlets for disposal of both products.

On September 11, BOGOC and the Government of Bolivia through YPFB signed a contract that will enable the company to build a pipeline to export oil from fields it has been developing for the last 2 years. The agreement calls for Gulf to build a 280-mile pipeline from its Santa Cruz fields to Sica Sica where it will join YPFB's pipeline to Arica, Chile. The existing 220-mile Sica Sica-to-Arica pipeline was completed in 1960 by YPFB but has never been used. Construction of the line was financed in part by a $5 million loan from Gulf. The loan has never been repaid and has accumulated an estimated $3 million in interest. The recent YPFB-Gulf agreement calls for Gulf to make another $2 million loan to make the existing pipeline operational. Both Gulf and YPFB will use the entire pipeline system. Productive capacity of approximately 30,000 barrels of crude oil daily was expected to be available when BOGOC completes its line. Construction work began on the Santa Cruz Sica Sica pipeline in December with the hope that the line would be completed by the end of 1965.

YPFB found 3 new oil and gas condensate fields (Tatarenda, Bulo Bulo, and Naranjillos) and 2 new dry gasfields (Laguinillas and Barredero). Tatarenda is the only one of the new fields with possibility for sizable crude production. Nine successful exploratory wells were drilled, 3 in the Tatarenda field, 4 in the Bulo Bulo and Naranjillos fields, and 2 in the Laguinillas and Barredero fields. YPFB was also successful in development well drilling, completing 10 oil wells and 4 gas wells. Seven of the oil wells were drilled in the Camiri and 3 in the Bermejo fields. Development drilling during the year totaled 31,653 meters.

TABLE 8.—Crude petroleum production by company and field

(42-gallon barrels)

Company and field	1960	1961	1962	1963	1964
Yacimientos Petroliferos Fiscales Bolivianos:					
Camiri-Guairuy	2,640,823	2,249,464	2,043,209	2,678,531	2,740,196
Bermejo-Toro	449,566	438,955	498,954	401,741	320,824
Sanandita-Camatindi	20,056	17,906	44,320	74,419	71,598
Los Monos			16,271	401	
Total	3,110,445	2,706,325	2,602,754	3,155,092	3,132,618
Bolivian Oil Co.: Madrejones	463,678	282,442	188,408	129,505	62,147
Bolivian Gulf: Caranda			125,938	116,318	95,647
Grand total	3,574,123	2,988,767	2,917,100	3,400,915	3,290,412

Because of increased consumption of crude oil by Bolivian refineries to meet national needs, exports to Argentina dropped sharply. Of the exports 90 percent, or 280,189 barrels, were made by YPFB. Imports of petroleum products were principally lubricating oils and aviation gasoline, the latter increasing 48 percent from 1963 to a total of 110,440 barrels. Consumption of refined products, excluding greases, increased over 200,000 barrels from 1963.

TABLE 9.—Bolivian consumption[1] of refined products

(42-gallon barrels)

Product	1963	1964
Motor fuel	946, 981	1, 020, 388
Fuel oil	653, 420	672, 642
Diesel oil	423, 310	447, 710
Kerosine	405, 261	447, 414
Aviation gasoline	81, 135	120, 346
Lubricating oils	20, 230	28, 575
Petroleum ether	629	507
Naphtha	131	87
Solvent	703	793
Liquefied gas	7	------------
Total	2, 531, 807	2, 738, 462

[1] Figures refer to actual military and civilian consumption through sales to consumers and including YPFB consumption.

One of the Paz Government's last official acts prior to its overthrow was to sign a decree effective on November 4, 1964, that increased the YPFB reserve area from about 5 million to 12 million hectares. This move made it more difficult for private oil companies to obtain concessions on promising territory for petroleum prospection. Previously, concessions on territory not in the reserve area were granted according to provisions of the petroleum code, which included an 11-percent royalty and a maximum tax of 50 percent. New concessions will have to be negotiated with the state petroleum entity, YPFB, an arrangement which will be definitely less advantageous to private companies.

SOURCE MATERIALS

Bolivia maintains no accurate data on total minerals production. COMIBOL issues relatively accurate figures for production, metallurgical results, and exports. Production by the small mines is sold to the Banco Minero, and therefore the exports of the Banco Minero plus those of the medium mines may be regarded as representative of the production of the private sector. As domestic consumption of most minerals is minimal, there is no significant inventory buildup of unsold minerals except gold and silver.

Preliminary export figures are prepared by the General Directorate of Mines (Dirección General de Minas) of the Ministry of Mines and Petroleum (Ministerio de Minas y Petróleo). Official statistics of exports and imports are prepared by the Ministry of Finance (Ministerio de Hacienda). The official export figures for 1963 were obtained from Boletín Estadístico No. 89, 1964. Official import statistics are usually published in the annual "Import Statistics" ("Importaciones") by the General Directorate of Statistics and Census of the Ministry of Finance (Dirección General de Estadistica y Censos, Ministerio de Hacienda). This publication, however, has not been available since the 1961 edition. Weights and values of the principal tariff classification groups were obtained directly from the foreign trade section of the General Directorate of Statistics, but without detail as to the source countries. Petroleum imports for 1963 were obtained also from Boletín Estadístico No. 89. Petroleum statistics and general economic data have been supplied by the U.S. Embassy in La Paz. Basic information has been obtained from field observations and conversations of the U.S. Bureau of Mines mining engineer in Bolivia and the Minerals Attaché at the U.S. Embassy in La Paz.

The Mineral Industry of Brazil

By Garn A. Rynearson[1]

⁂

THE REVOLUTION and reform that dominated all other events in Brazil during 1964 profoundly altered the future development of the nation's mineral industry but had little immediate effect on the country's relative position in the world mineral economy. In 1964, Brazil continued to lead the world in production of quartz crystal and beryl, was second in sheet mica, third in manganese ore and in columbium and tantalum ores, and became the eighth largest producer of iron ore. Major portions of the output of iron and manganese ores and virtually all output of the other items were produced for export to foreign consumers.

National account estimates for 1964 indicated a decrease of about 2 percent in gross domestic product (GDP) in contrast to an estimated increase of 2 percent for 1963. A 12-percent decrease in agricultural output, largely the result of a decline in coffee production, and a 6.6-percent decrease in commercial activity were partly offset by a 5-percent increase in industrial activity; these categories contributed about 28.2 percent, 12.5 percent, and 25.8 percent of the GDP, respectively. Within the industrial category, gains of 5.7 percent were credited to both the metallurgical sector and the nonmetallic mineral processing sector, which together accounted for about 18.7 percent of all industrial output. The estimates indicated an overall increase of 22.4 percent for mining and extraction of mineral products; however, this estimate mainly reflects a sharp increase in iron ore output and obscures the fact that mine output of some minerals declined substantially. Mining was weighted 1.8 percent of total industrial activity.

GOVERNMENT POLICIES AND PROGRAMS

The most significant mineral developments during the year were scored not by accomplishment in the mines and mills but rather by an unprecedented series of governmental actions which by yearend gave new purpose and direction to the mineral industry. The political climate that prevailed prior to the revolution of March 31, 1964, resulted in two government decrees directed against foreign participation in the mineral industry. Although neither decree was fully implemented and both were subsequently countermanded, they were important background factors in shaping the mineral policies of the new regime.

---

[1] Physical scientist, Division of International Activities.

Expropriation of private oil refineries was decreed on March 13, 1964, theoretically completing the state monopoly on petroleum. The intended transfer of control to PETROBRÁS, the state-owned petroleum entity, was interrupted by the revolution and for the remainder of the year the private firms continued to operate in near-normal fashion under writs of injunction.

By Decree No. 53,161 of December 10, 1963, all authorizations to explore and exploit mineral deposits became subject to immediate review and cancellation if irregularities were discovered. Under this decree, involvement of foreign interests in mining activities was considered an irregularity based on nationalistic interpretation of Article 6 of the Mining Code of 1940. This interpretation held that mineral exploitation was reserved exclusively to Brazilian nationals, despite a Supreme Court decision earlier in 1963 that Article 6 was unconstitutional and that foreign participation in many mining activities was indeed legal. The revolution intervened before the intent of Decree No. 53,161 could be carried out, and it was officially nullified by Decree No. 54,042 on July 23, 1964.

The aforementioned Supreme Court decision was to become fundamental to the mineral policy of the new government. It involved a case in which a request for a concession to operate as a mining firm was denied to a Brazilian firm, GRANIMAR, S.A.—Marmores e Granitos, on the grounds that it had admitted foreigners (Italians) as shareholders. On April 3, 1963, the Supreme Court, by a 6 to 2 decision, upheld a writ of injunction filed by GRANIMAR against the then incumbent Minister of Mines and Energy for refusing to grant the mining rights applied for. The decision for GRANIMAR was based mainly on the contention that Article 153, Paragraph 1, of the 1946 Constitution modified the prior policy on foreign ownership incorporated in the 1937 Constitution and that it was intended to revoke Article 6 of the 1940 Mining Code. Applicable sections of Article 6 provided that "The right to prospect or exploit (mineral deposits) can be granted only to Brazilians, natural or juridical persons, the latter being constituted by Brazilian partners or shareholders," and further that "The operation of mining corporations is subject to Federal authorization upon petition—showing proof of its organization and of the Brazilian nationality of the partners or shareholders." Article 153, Paragraph 1, provides that "Authorizations of concessions (for the exploitation of mineral and hydroelectric resources) shall be granted exclusively to Brazilians or to societies (partnerships) organized in the country, preference to exploit being assured to the proprietor of the soil." The court pointed out that Article 153 did not specify that membership of the society be restricted to Brazilian nationals.

A subsequent reading of the court's original decision was delivered to the President of the Chamber of Deputies on December 12, 1963, and was published in the Diário do Congresso Nacional on December 16. Nevertheless, the unconstitutionality of Article 6 was not officially recognized, as required by the Constitution, until Senate Resolution No. 16 of 1964 to that effect was published in the Diário do Congresso Nacional of June 27, 1964.

Not long after the revolution, the new Government revealed its position on mineral development in a Statement of Motives (No.

391–64) prepared by the Minister of Mines and Energy which was approved by the President and published in the Diário Oficial on July 1, 1964. This policy statement recognized the prime importance of mineral development to the economy of the country and gave high priority to the intensive and immediate utilization, either for domestic needs or for export, of known mineral resources and to the urgent need for further evaluation of the country's resource potential. The statement declared support for free enterprise in mineral mining, processing, transport, and trade contingent to the requirements of national security and other areas of supreme national interest. It also expressed the intent to confine government activity to existing state enterprises and to undertakings that do not warrant development by private interests.

The Government signified its intention to actively seek foreign investment capital and to make existing and potential foreign investments more attractive by means of the so-called Profits Remittance law (No. 4,390) of August 29, 1964. Law No. 4,131 of September 3, 1962, which was regulated and implemented so as to almost entirely prevent the legal remittance of profits, dividends, royalties, and technical assistance payments outside the country, was amended by the new law to liberalize substantially the treatment of foreign investment and financial remittances; however, the implementing regulations were deferred until early in 1965.

On October 8, 1964, the President signed Law No. 4,425 that established a single tax of 10 percent on minerals in general and 8 percent on coal; the 8-percent Federal tax on gold mining will apply until 1975 as previously guaranteed. The law covers all mineral and fossil substances (including mineral water) except liquid fuels and gases.[2] Except for income and stamp taxes and taxes paid for services rendered by the Government directly to the miner, the single tax precludes the assessment of any other Federal, State, or municipal tax on mineral deposits or mines, on their crude product, or on the mechanically processed or agglomerated product consumed or prepared within the concession area. A schedule of taxable values of mineral products is to be prepared biannually, based on the average f.o.b. value of export products or on the average wholesale price in principal domestic markets for products not exported, less a 40-percent allowance for transportation; the value of coal is to be based on prices set by the National Coal Plan. The tax is to be paid monthly by all mineral producers, including Federal, State and municipal entities, except that the tax on the product of prospectors of noble metals and hand miners of precious and semiprecious stones is to be paid by the original purchaser or processor. The municipality where the mine is located will receive 20 percent (28 percent for coal), and State of origin 70 percent (62 percent for coal), and the Federal Government 10 percent of the tax revenue. The States and municipalities must apply their shares to investments on highways and transportation, energy, education, agriculture, and industry. The Federal share is to be used to help finance a National Mining Fund that was created by the law to provide and finance mineral prospecting in Brazil and to promote research and development in the minerals field.

---

[2] A single tax on liquid and gaseous fuels and lubricants, levied by the Federal Government, was established by the Constitution and implemented by subsequent legislation. Regulations concerning the computation of this tax and the allocation of funds derived therefrom were amended (and a National Paving Fund was created) by Law No. 4,452 of Nov. 5, 1964; however, the basic provisions of the law remained unchanged.

Highlight of the Government's portfolio of mineral actions was the iron-ore export policy decree which President Castelo Branco signed on December 22, 1964. In effect, this new policy opened the door for large-scale private enterprise participation—foreign or national—in the export of iron ore from Brazil and thus represented a reversal in Brazilian economic policy that had previously tended to favor government domination in the exploitation and export of the country's iron ore. The Government controlled Cia. Vale do Rio Doce (CVRD) will retain effective control over ores shipped through its railroad and port facilities in the Rio Doce Valley, but the new policy authorizes and encourages private companies to greatly increase exports of ore through other outlets.

The decree provides for private company construction and operation of necessary terminal facilities for ore loading in Septiba Bay, 50 to 100 kilometers west of the Port of Rio de Janeiro; however, exporters must continue to utilize the facilities of the latter port to the extent of its capacity. Rail transport of the ore from Minas Gerais to these ports must be contracted to the Government-owned railroad system, Rede Ferroviaria Federal, S.A. Additional rolling stock needed for increasing ore shipments, loading and unloading facilities, and connecting spur lines must be provided and financed by the exporters; however, compensation for investments in rolling stock will be made through freight rebates.

According to the decree, participating foreign-controlled companies must reinvest all profits over 12 percent in mining or other approved projects in the State from which the ore is taken whereas domestically controlled companies must reinvest at least half of profits over 12 percent in the State. In addition, foreign companies must invest their initial 12 percent profit in Brazil during the first 5 years of operation. Foreign companies also will be required to offer at least 40 percent of their stock to Brazilian investors for a period of 4 months and again for 2 years if 40 percent is not subscribed for during the first offer.

PRODUCTION

Overall performance of the mineral industry during 1964 was somewhat less than had been expected as expansion plans and new investments were curtailed while industry speculated on and adjusted to the evolving policies and regulations of the new government. Among the major sectors of the industry, the nation's iron mines, steel mills, aluminum smelters, lime and cement plants, and oil refineries registered notable increases in total ouptut, but the effective production of the oilfields and coal mines was below 1963 levels and output of salt, gypsum, and dolomite fell markedly.

TABLE 1.—Brazil: Production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity [2]	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Bauxite	120,763	111,394	190,708	[r] 169,636	131,650
Alumina	31,342	36,139	38,792	42,698	50,921
Metal, unwrought	18,175	20,029	20,141	17,610	26,640
Semimanufactures	6,638	7,170	3,105	5,027	2,734
Arsenic, white	211	58	149	[r] 293	188
Beryl (exports)	3,472	3,178	3,011	1,968	1,421
Bismuth (exports) kilograms	2,000	1,000	----------	----------	----------
Chromite	5,666	15,456	24,839	[3] 17,053	[3] 9,440
Columbium and tantalum:					
Pyrochlore concentrate	----------	[r] 1,528	[r] 102	----------	323
Columbite-tantalite concentrates:					
Columbite [4] kilograms	20,000	14,000	14,000	20,000	[5] 11,178
Tantalite [4] do	193,000	94,000	125,000	111,000	[5] 82,000
Total	213,000	108,000	139,000	131,000	[5] 93,178
Copper:					
Ore:					
Gross tonnage	70,241	68,773	[r] 74,829	84,760	110,631
Copper content [e]	1,100	1,700	1,600	1,500	2,000
Refined metal	1,212	1,659	[r] 2,000	[r] 2,000	[p] 3,000
Gold bullion [6] troy ounces	118,894	118,636	[r] 127,156	131,979	142,492
Iron and steel:					
Iron ore thousand tons	9,345	10,220	[r] 10,737	11,219	16,972
Pig iron do	1,560	1,750	1,832	[7] 2,375	[7] 2,446
Cast iron do	140	151	[p] 371	[p] 342	[p] 334
Ferroalloys do	34	34	[r] 39	44	NA
Ingot steel do	2,279	2,485	[r] 2,565	[7] 2,812	[7] 3,029
Cast steel do	17	15	[p] 43	[p] 41	[p] 48
Rolled steel do	1,648	1,888	[7] 1,956	[7] 2,163	[7] 2,408
Lead:					
Ore:					
Gross tonnage	140,903	175,422	204,193	240,282	236,144
Lead content [e]	11,100	[r] 14,000	[r] 15,200	[r] 17,400	NA
Metal, primary, smelter	9,976	[r] 12,578	[r] 13,689	15,643	13,204
Manganese ore	999,163	1,016,353	1,170,688	1,254,390	1,349,071
Nickel:					
Ore, garnierite	5,005	4,431	15,852	52,997	54,494
Nickel content of ferronickel	95	[r] 90	[r] 240	1,030	[e] 1,000
Rare-earth metals and compounds:					
Monazite [8]	1,046	[r] 1,146	[r] 3,879	[r] 2,221	665
Rare-earth salts (exports)	2,409	6,160	1,063	865	899
Metals and alloys (exports) [9] kilograms	1,250	4,500	2,250	1,500	2,500
Silver bullion troy ounces	252,930	231,936	[r] 250,004	339,448	305,367
Tin:					
Cassiterite concentrates:					
Gross tonnage	2,635	985	1,239	1,953	1,936
Tin content [e] long tons	1,556	582	732	[r] 1,150	1,670
Metal, smelter do	1,311	1,525	[r] 1,835	2,051	[p] 1,731
Titanium ores:					
Ilmenite	[e] 2,000	[10] 4,778	[10] 5,344	[10] 5,782	[10] 8,271
Rutile	216	[r] 383	[r] 352	[r] 389	286
Tungsten concentrate, scheelite:					
Gross tonnage	1,412	1,029	1,034	463	318
60 percent WO_3 equivalent	1,694	1,235	1,241	556	382
Zirconium:					
Zircon	130	459	648	[r] 962	1,756
Baddeleyite-caldasite	5,638	6,613	2,320	325	516
Nonmetals:					
Agate, rough (exports) kilograms	259,996	240,244	276,187	219,006	337,654
Asbestos minerals [11]	3,500	3,100	4,400	[3] 1,306	NA
Barite	40,337	62,445	54,650	34,111	33,537
Cement: [12]					
Portland, common thousand tons	[r] 4,418	[r] 4,678	[r] 5,039	5,154	5,530
Portland, high resistance do	[r] 3	1	----------	----------	----------
Portland, white do	26	30	[r] 33	30	34
Total	[r] 4,447	[r] 4,709	5,072	5,184	5,564
Corundum and emery (exports)	4	4	7	1	4
Diamonds:					
Gem [e] carats	175,000	175,000	175,000	175,000	175,000
Industrial [e] do	175,000	175,000	175,000	175,000	175,000
Diatomite [e]	2,800	3,000	3,200	3,200	3,200
Dolomite	226,146	313,053	[r] 421,327	477,805	330,387
Feldspar [e]	40,000	40,000	40,000	40,000	40,000
Fluorspar	1,032	365	NA	NA	NA
Gem stones, (exports) [13] kilograms	250,346	243,007	397,389	417,799	702,534
Graphite	1,300	[r] 1,445	[r] 1,610	[e] 1,500	NA

See footnotes at end of table.

TABLE 1.—Brazil: Production of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity [2]	1960	1961	1962	1963	1964
Nonmetals—Continued					
Gypsum	103,101	156,035	108,079	[r] 105,620	84,405
Lime	1,069,299	1,279,576	1,186,211	1,207,952	1,438,028
Lithium ores and compounds:					
Amblygonite (exports)	50	----------	----------	----------	----------
Spodumene (exports)	----------	----------	150	25	----------
Lithium carbonate (exports)	126	71	19	----------	----------
Magnesite	63,315	76,702	93,756	90,298	93,740
Marble, dimension stone	49,533	48,911	59,393	53,011	50,952
Mica, muscovite	2,014	4,128	1,762	1,492	[5] 1,741
Mineral water ... thousand liters	98,293	108,685	98,870	128,516	103,075
Nitrogenous fertilizers, manufactured:					
Ammonium nitrate	NA	305	2,089	3,667	4,881
Ammonium calcium nitrate	69,564	59,638	57,045	56,272	27,780
Ammonium sulfate	7,371	6,802	8,282	9,570	9,742
Phosphate fertilizers, natural:					
Ores and concentrates, as reported:					
Apatite	203,184	243,908	310,117	215,288	195,077
Phosphate rock	676,447	415,513	255,440	63,506	51,142
Total	879,631	659,421	565,557	278,794	246,219
Marketable concentrates [14]	241,743	225,309	192,442	146,754	149,355
Quartz crystal (exports)	1,392	2,105	1,587	1,246	1,685
Salt [15] ... thousand tons	923	920	1,240	1,193	754
Sulfur, elemental	----------	2,605	4,561	5,750	NA
Talc, soapstone, pyrophyllite	19,918	23,776	38,300	34,915	48,115
Mineral fuels:					
Coal:					
Mine-run ... thousand tons	2,330	2,390	2,508	[16] 2,571	[16] 3,246
Derivatives:					
Coke, high temperature ... do	704	699	720	[r] 858	[r] 912
Coke, gas-house ... do	[e] 250	285	[e] 285	[e] 285	[e] 280
Manufactured gas ... million cubic feet	NA	13,106	NA	NA	NA
Natural gas:					
Gross withdrawal ... do	19,962	19,660	19,082	[r] 18,801	19,844
Natural gas liquids ... 42-gallon barrels	----------	----------	----------	563,803	831,776
Petroleum:					
Crude:					
Production ... thousand 42-gallon barrels	29,613	34,807	33,401	[r] 35,710	[r] 33,313
Refinery runs to stills ... do	65,483	79,980	103,888	111,298	113,654
Refinery products:					
Gasoline ... do	21,372	23,688	30,782	32,799	36,536
Kerosine ... do	4,031	3,945	4,364	4,053	4,546
Distillate fuel oil ... do	9,910	15,071	19,625	[r] 22,324	23,910
Residual fuel oil ... do	23,575	28,896	38,762	41,094	39,290
Lubricants ... do	24	13	19	52	3
Asphalt ... do	1,254	1,271	1,428	1,596	1,288
Solvents ... do	723	817	803	748	795
Liquefied gases ... do	3,007	3,161	3,421	4,113	5,417
Other ... do	612	563	697	725	507
Total refinery products ... do	64,508	77,425	99,901	107,504	112,294
Carbon black	16,000	16,995	19,700	24,850	23,902

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Includes export data on some commodities for which production data are not available and on commodities for which export data are more representative than incomplete data on production.

[2] In addition to commodities tabulated, Brazil produces antimony, bentonite, china and refractory clays, glass sand, kyanite, limestone, pyrite, ocher, thorium compounds, tungsten metal, uranium oxide, vermiculite, and zinc ore, as well as clay, sand, gravel, and stone for construction purposes, but data on quantities are not available.

[3] Preliminary figure for State of Bahia only.

[4] Production of columbite and tantalite are not separately reported; total production allocated on basis of export ratio.

[5] Exports.

[6] Reported production for Minas Gerais and Paraná. Perhaps as much as 20 percent of total gold recovered in Brazil is not reported statistically.

[7] Data from U.S. Embassy, Rio de Janeiro, Brazil. Department of State Airgram A-465, Nov. 10, 1965, 30 pp.

[8] Includes production of Comissão Nacional de Energia Nuclear (CNEN) for 1961–64 not previously reported.

[9] Data on actual production not available except for 1964, when it was reported as 13 tons.

[10] Production of Comissão Nacional de Energia Nuclear only.

[11] Includes anthophyllite, chrysotile, and tremolite fiber. Data shown are estimates, as ore rather than fiber is reported as production for some mines.

[12] Data from Sindicato Nacional de Indústria do Cimento (SNIC).

[13] Includes rough and cut (but unset) stones except diamonds and rough agate.

[14] Production of marketable apatite and phosphate rock is not reported separately; however, relative quantities produced are indicated by concentrates sold under government subsidy as follows: Apatite, 1960—68,674 tons; 1961—95,002 tons; 1962—100,286 tons; 1963—63,422 tons; phosphate rock, 1960—171,063 tons; 1961—116,753 tons; 1962—90,839 tons; 1963—76,835 tons.

[15] Data for 1961–64 provided by Instituto Nacional do Sal.

[16] Data from Plano do Carvão Nacional. Merchantable (cleaned) coal produced was 1,798,000 tons in 1963 and 1,782,000 tons in 1964.

TRADE

Although total trade value diminished by 7 percent, in 1964 a slight increase in total sales abroad coupled with notable success in the Government's efforts to curb imports resulted in a favorable trade balance for the first year since 1956. Total value of exports increased from $1,406 million[3] in 1963 to $1,430 million in 1964, whereas total imports decreased from $1,487 million to $1,263 million. A little more than one-half of the export gain was attributable to a net increase in foreign sales of metals and minerals while decreased purchases of such materials from abroad accounted for more than one-third of the exchange savings realized on imports.

TABLE 2.—Brazil: Value of trade in metals and minerals

(Thousand U.S. dollars)

Exports	1963	1964
Metals:		
Beryl, industrial	609	409
Columbium and tantalum	1,432	334
Iron ore	70,919	80,638
Iron and steel	3,258	17,235
Manganese ore	24,625	20,614
Other	1,047	774
Total	101,890	120,004
Nonmetals:		
Barite	217	471
Gem stones, including agate	636	966
Mica	908	841
Quartz crystal	1,187	1,568
Other	419	667
Total	3,367	4,513
Mineral fuels:		
Crude petroleum	8,936	--------
Diesel oil	--------	2,648
Other	482	16
Total	9,418	2,664
Grand total	114,675	127,181

Imports	1963	1964
Metals:		
Aluminum	13,625	9,895
Copper	34,688	22,207
Iron and steel	87,267	51,823
Zinc	11,210	11,539
Other	24,009	16,278
Total	170,799	111,742
Nonmetals:		
Asbestos	4,453	3,076
Caustic soda	13,147	12,566
Nitrogenous fertilizers	12,353	10,745
Phosphatic fertilizers	9,717	7,649
Potassic fertilizers	7,666	5,696
Sulfur	4,349	4,242
Other	12,049	8,053
Total	63,734	52,027
Mineral fuels:		
Coal and coke	15,187	29,539
Crude petroleum	176,362	170,366
Refined petroleum products	70,664	58,127
Other	3,937	2,784
Total	266,150	260,816
Grand total	500,683	424,585

Iron ore exports increased 17.7 percent to 9,729,630 tons but the average f.o.b. value of the ore sold continued to fall and earnings increased by only 13.7 percent. Nonetheless, iron ore regained third rank among the most valuable of all export commodities as sugar exports decreased to an 8-year low. Exports of manganese ore remained at a near-normal level despite unusually low market prices which resulted in a sharp drop in earnings and nearly placed manganese out of the top 10 export commodities. Iron and steel registered the most impressive gain in sales abroad as iron and steelmakers found export outlets for excess stocks resulting from a downturn in the domestic market.

Imports of most major metal and mineral commodities were cut substantially during 1964. These reductions generally were un-compensated by increased domestic production, the principal exceptions being iron and steel, aluminum, and most petroleum refinery products. The austerity measures did not encompass coal and coke, however, and the total expenditure on foreign supplies of these items nearly doubled as imports increased 56 percent and 289 percent, respectively. Crude oil imports increased a modest 4.1 percent in quantity but were valued at $6 million less than 1963 imports; however, Brazil did not have an excess of domestic high-paraffin crude oil to export in 1964 and the net trade expenditure in crude oil was nearly $3 million more than in 1963.

---

[3] Data on values presented in this chapter are for the most part given in the monetary unit used in sources because of conversion problems caused by variations in exchange rates. At yearend, the free market exchange rate for cruzeiros (Cr$) to U.S. dollars was Cr$1,850=US$1.00.

TABLE 3.—Brazil: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Bauxite	2,000	2,300	Argentina 1,300; Uruguay 1,000.
Oxide	13	26	Mainly to Argentina.
Metal, semimanufactures	28	(1)	All to Bolivia.
Beryl	3,011	1,969	All to United States.
Columbium and tantalum:			
Pyrochlore concentrate	----------	765	Do.
Columbite ... kilograms	17,311	19,399	Do.
Tantalite ... do	146,423	104,781	Do.
Iron and steel:			
Iron ore ... thousand tons	7,650	8,268	West Germany 2,419; United States 841; Italy 791.
Slag, scrap, and other residues	51	230	All to Japan.
Pig iron	50	46,994	Do.
Ferroalloys:			
Ferromanganese	5,016	----------	
Ferronickel	----------	43	France 40; Argentina 3.
Ingot steel	3,880	[2] 166	France 160; Argentina 5; United States 1.
Semimanufactures	1,616	6,475	Venezuela 6,034; Bolivia 202; Paraguay 82.
Manganese ore	759,915	840,709	United States 771,604; West Germany 38,078; France 19,102.
Rare-earth metals:			
Ferrocerium ... kilograms	2,250	1,500	All to Portugal.
Cerium chloride	921	865	Austria 400; Italy 174; United States 110.
Cerium carbonate	112	----------	
Unspecified compounds	31	----------	
Tungsten:			
Scheelite concentrate	625	798	France 550; Belgium-Luxembourg 200; Netherlands 28.
Estimated 60 percent WO_3 equivalent of scheelite concentrate.	750	960	
Metal, all forms ... kilograms	501	544	United Kingdom 457; Chile 54; Argentina 33.
Zirconium silicate (zircon) ... do	3,300	7,000	All to Argentina.
Other [3]	59	62	
Nonmetals:			
Abrasives [4]	163	92	Mainly to Argentina.
Agate, rough ... kilograms	276,187	219,006	West Germany 87,751; United States 53,936; Netherlands 47,863.
Asbestos:			
Fiber	20	----------	
Construction materials	20	3	All to Paraguay.
Asbestos-cement products	2	----------	
Barite	51,002	27,112	Trinidad 22,875; United States 4,237.
Cement, portland	2,257	2,628	Paraguay 2,280; Bolivia 348.
Clays and clay products:			
China clay	100	200	All to Uruguay.
Nonrefractory clay products	111	255	Paraguay 158; Bolivia 85; Chile 6; United States 6.
Diamonds, industrial ... carats	75,855	305	All to United States.
Gem stones: [5]			
Rough or uncut ... kilograms	86,872	335,229	United States 131,055; West Germany 70,030; Hong Kong 67,430.
Cut, unset ... do	55	5	Belgium-Luxembourg 3; United States 1; West Germany 1.
Other [6] ... do	310,462	82,566	United States 55,522; Hong Kong 9,755; West Germany 6,653.

See footnotes at end of table.

TABLE 3.—Brazil: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Nonmetals—Continued			
Lithium compounds:			
Spodumene	150	25	All to Netherlands.
Lithium carbonate	19	----------	
Magnesite	4,873	584	France 320; Netherlands 200; Argentina 64.
Magnesium oxide	200	200	Belgium-Luxembourg 100; Spain 100.
Mica, muscovite:			
Sheet, block, scrap, or ground	882	1,252	United States 1,153; Japan 48; West Germany 38.
Manufactures	27	15	Mainly to United States.
Quartz crystal:			
Electronic and optical	174	172	United States 90; Japan 35; United Kingdom 33.
Lasca (fusing grade)	1,413	1,175	West Germany 487; United Kingdom 292; Japan 226.
Refractory bricks and similar products.	108	33	All to Bolivia.
Salt	----------	30	Do.
Stone, dimension:			
Natural or roughly worked:			
Granite	2,326	4,183	Italy 2,110; United States 1,081; West Germany 633.
Marble	13	5	All to Paraguay.
Worked stone, not further specified.	2	10	All to West Germany.
Talc, industrial	20	11	Chile 10; Paraguay 1.
Other [3]	54	7	
Mineral fuels:			
Petroleum:			
Crude .... thousand tons	298	360	United States 300; Netherlands Antilles 60.
Refinery products:			
Fuel oil .... do	77	32	All to United States.
Other	7	9	Mainly to Paraguay.

[1] Less than ½ unit.

[2] Other sources indicate most, if not all, of quantity shown was ferronickel.

[3] Includes material not identified by commodity in source and commodities not listed separately in table.

[4] Includes emery, artificial corundum, and diamond and other gem stone dust. Excludes grindstones and industrial diamond.

[5] Excludes rough agate.

[6] Probably represents rejected material suitable for tumbling and mineral suites.

Source: Serviço de Estatística Econômica e Financeira, Comércio Exterior.

TABLE 4.—Brazil: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources 1963
Metals:			
Aluminum:			
Oxide	4,475	571	Jamaica 530; United States 21; West Germany 19.
Metal:			
Unwrought	19,507	25,815	Canada 16,182; United States 5,377; Norway 1,883.
Semimanufactures	283	456	United States 225; West Germany 131; Japan 51.
Antimony:			
Ores	54	80	All from Peru.
Oxide	63	35	United Kingdom 14; West Germany 7; Belgium-Luxembourg 6; Netherlands 6.
Metal, crude	641	589	Mainland China 437; Czechoslovakia 80; Peru 33.
Arsenic:			
Sulfides, natural	----------	2	All from Belgium-Luxembourg.
White	797	755	France 333; Sweden 312; East Germany 95.
Metal	3	5	Mainly from Sweden.
Bismuth metal, all forms. .... kilograms	7,393	10,271	Peru 5,313; Mexico 2,948; United Kingdom 1,007.
Cadmium metal, all forms .... do	34,485	46,692	Mexico 18,564; Peru 14,010; Canada 3,481.
Calcium metal .... do	1,000	----------	

See footnotes at end of table.

TABLE 4.—Brazil: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Chromium:			
Chromite	4,215		
Oxides	144	182	West Germany 108; United States 23; Italy 15.
Metal, all forms	3	6	West Germany 4; United States 1; Japan 1.
Cobalt:			
Oxides	43	36	United Kingdom 28; Belgium-Luxembourg 6; West Germany 2.
Metal, all forms		90	Belgium-Luxembourg 83; United States 4; West Germany 2.
Copper:			
Sulfate	4,728	4,147	United Kingdom 1,156; Belgium-Luxembourg 1,098; West Germany 982.
Metal:			
Scrap	10		
Refined, unalloyed	42,012	48,117	Chile 32,084; Peru 9,068; Mexico 4,121.
Alloys, unwrought	100	93	All from Argentina.
Semimanufactures, including alloys.	380	383	United States 178; West Germany 163; Netherlands 16.
Gold:			
Bullion troy ounces	468	561	All from United Kingdom.
Semimanufactures do		39	All from United States.
Manufactures [1] do	138		
Iron and steel:			
Scrap	9,726	162	United States 153; Paraguay 9.
Sponge, powder, granules	508	686	United States 608; Canada 50; Sweden 11.
Ferroalloys	1,427	1,563	Japan 318; France 301; Netherlands 284; Sweden 284.
Semimanufactures	180,013	397,746	Japan 122,502; West Germany 55,542; United States 47,778.
Lead:			
Oxides	360	1,249	Mexico 677; Peru 566; United States 6.
Metal, all forms	8,082	15,839	Mexico 8,554; Peru 7,271; Denmark 10.
Magnesium metal, all forms	617	1,807	United States 1,604; Norway 198; Canada 5.
Manganese:			
Oxides	1,820	1,638	United States 1,378; Japan 236; Austria 10.
Metal, all forms		16	Japan 10; Republic of South Africa 3; United States 2.
Mercury 76-pound flasks	1,330	3,357	Mexico 3,035; Spain 29; Chile 25.
Molybdenum metal, all forms. kilograms	7,591	6,512	Netherlands 3,477; United States 2,399 Sweden 454.
Nickel:			
Sulfate	242	353	West Germany 290; United Kingdom 36; Finland 26.
Metal:			
Scrap	22	23	All from United States.
Refined	880	327	United States 271; Canada 29; Norway 23.
Semimanufactures	312	333	United States 179; West Germany 58; France 41.
Platinum-group metals:			
Platinum, unwrought. troy ounces	7,268	23,545	France 11,130; United States 7,413; West Germany 4,326.
Platinum, semimanufactures. do	369	267	West Germany 218; United States 49.
Platinum, manufactures.[1] do	484	4,654	Sweden 4,533; West Germany 86; United States 35.
Other, unwrought do	1,125	9,780	France 7,282; Hungary 1,963; United States 514.
Other, semimanufactures do	239	123	United States 91; West Germany 32.
Radioactive and associated materials:			
Radioactive elements and isotopes and their compounds [2] value.	$38,941	$96,020	Canada $77,366; United States $24,697; United Kingdom $3,487.
Stable isotopes and their compounds. kilograms	21	3	Denmark 2; United States 1.
Other compounds of thorium and uranium and of rare earth metals. grams	350,465	139,951	United States 116,241; West Germany 10,375; Japan 10,000.
Selenium kilograms	4,318	4,091	Canada 1,444; United States 1,396; Sweden 850.
Silicon metal	168	258	France 120; Italy 70; Norway 65.

See footnotes at end of table.

TABLE 4.—Brazil: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Silver:			
Bullion troy ounces	1,075,714	1,195,300	Argentina 477,213; Peru 333,660; Mexico 282,798.
Semimanufactures do	40,342	55,668	West Germany 27,039; Switzerland 11,060; United States 8,576.
Sodium metal kilograms	7,084	5,404	France 5,000; United States 354; West Germany 50.
Tantalum, semimanufactures do	34	9	Italy 5; United States 4.
Tellurium do	----------	136	All from United States.
Tin:			
Cassiterite concentrates long tons	1,843	2,942	Thailand 2,845; Bolivia 47; Netherlands 44.
Oxides do	45	59	United Kingdom 30; West Germany 29.
Metal, all forms do	11	8	Mainly from United States.
Titanium:			
Rutile, concentrates	----------	10	All from Australia.
Oxides, manufactured	5,457	7,095	United Kingdom 2,154; West Germany 1,553; Japan 1,285.
Tungsten:			
Wolframite concentrates	----------	20	All from Portugal.
Metal, all forms kilograms	6,239	7,094	Sweden 2,806; Netherlands 1,746; United States 1,701.
Zinc:			
Oxides	83	122	Poland 69; United States 24; West Germany 24.
Lithopone	9,775	7,832	Mainland China 2,259; United Kingdom 1,605; Mexico 1,316.
Metal:			
Scrap	1	2	All from United Kingdom.
Refined	42,234	38,902	Peru 16,162; Mexico 6,264; Australia 3,943.
Semimanufactures	554	448	Belgium-Luxembourg 379; West Germany 59; United Kingdom 10.
Metallic oxides, not specified	218	266	United States 67; West Germany 46; United Kingdom 44.
Other [3]	84	2	
Nonmetals:			
Abrasives:			
Natural [4]	78	37	Greece 20; United States 7; Italy 4; United Kingdom 4.
Corundum, artificial	234	467	West Germany 353; United Kingdom 66; Italy 41.
Silicon carbide	179	158	United States 114; Norway 35; West Germany 8.
Carbides, not specified	5	7	Sweden 3; West Germany 3; United Kingdom 1.
Asbestos:			
Fiber	18,686	20,206	Canada 17,755; Republic of South Africa 1,108; United States 739.
Construction materials	367	268	United Kingdom 164; West Germany 55; United States 16.
Barium compounds: [5]			
Barite	28	35	All from United States.
Sulfate	----------	598	West Germany 384; mainland China 143; United Kingdom 60.
Oxide kilograms	63	5,442	All from United States.
Boron:			
Borax, crude	1,100	----------	
Sodium borates, purified	6,312	8,073	United States 4,070; Argentina 3,969; France 19.
Boric acid	----------	982	United States 980; West Germany 2.
Bromine kilograms	1,122	156	West Germany 127; United States 20; United Kingdom 9.
Caustic potash	922	1,565	United States 495; France 414; Poland 197.
Caustic soda	146,870	158,644	United States 79,715; United Kingdom 30,187; West Germany 16,949.
Cement:			
Portland, common	1,169	6,375	All from Uruguay.
Magnesian	52	40	All from Austria.
Refractory	----------	1,319	United States 728; France 451; Japan 40.
Nonspecified cements	515	518	France 249; West Germany 228; United States 29.
Chalk, natural	2,313	2,763	France 1,165; Denmark 982; Sweden 413.

See footnotes at end of table.

TABLE 4.—Brazil: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals—Continued			
Clays:			
Bentonite	7,205	6,214	United States 3,933; Argentina 2,225; West Germany 30.
China clay	198	237	United States 226; United Kingdom 11.
Refractory clay	77	153	West Germany 83; United States 59; France 11.
Nonspecified clays	358	584	United States 498; Argentina 82; United Kingdom 4.
Cryolite:			
Natural	600	564	Denmark 555; United States 5; United Kingdom 4.
Synthetic	620	799	Canada 669; Italy 130.
Diatomite and infusorial earth	1,121	1,679	United States 1,615; West Germany 64.
Fertilizer materials:			
Nitrogenous:			
Chilean nitrates	44,736	51,552	All from Chile.
Other	137,806	200,834	West Germany 99,481; Belgium-Luxembourg 59,942; Netherlands 20,467.
Phosphatic:			
Phosphate rock, natural	95,880	221,832	Togo 109,657; United States 101,790; Morocco 8,944.
Superphosphate	14,237	9,780	United States 4,404; Poland 3,969; Netherlands 1,407.
Triple superphosphate	44,200	71,410	United States 48,131; Netherlands 11,861; Tunisia 8,378.
Thomas slag	2,298	4,725	West Germany 3,098; Belgium-Luxembourg 1,627.
Other	5,004	6,906	Japan 4,469; Belgium-Luxembourg 2,437.
Potassic:			
Potassium chloride	105,747	146,497	West Germany 40,827; France 27,700; U.S.S.R. 19,905.
Other compounds	9,446	4,943	West Germany 1,685; East Germany 1,400 Israel 978.
Mixed and nonspecified fertilizers.	525	299	West Germany 298; France 1.
Fluorspar	552	450	United Kingdom 350; France 100.
Graphite, natural	192	3	United States 1; Argentina 1.
Gypsum	32	40	All from West Germany.
Iodine ... kilograms	16,231	10,588	Chile 4,615; United Kingdom 2,369; Belgium-Luxembourg 1,300.
Magnesium oxide	89	119	France 31; United States 30; United Kingdom 22.
Mica:			
Sheet, block, scrap, or ground. ... kilograms	1,018	300	All from United States.
Manufactures ... do	5,075	26,664	United States 22,909; Switzerland 2,555; Belgium-Luxembourg 722.
Mineral pigments:			
Magnetite	255	----------	
Other iron oxides, natural or synthetic.	1,483	1,390	Spain 670; West Germany 614; Denmark 59.
Earth colors ... kilograms	3,393	3,376	France 3,000; United States 376.
Phosphorus, elemental	95	112	United Kingdom 49; West Germany 34; Japan 21.
Refractory bricks and similar products.	22,110	20,162	United States 6,900; Italy 7,789; France 1,876.
Salt, pure sodium chloride	38	178	United Kingdom 158; West Germany 14; United States 6.
Silex or flintstone, crude	654	532	France 300; Denmark 222; Belgium-Luxembourg 10.
Soda ash	46,415	51,692	United Kingdom 24,641; France 6,420; Yugoslavia 6,234.
Sodium sulfate	317	4,595	West Germany 2,906; Chile 794; Belgium-Luxembourg 500.
Stone, dimension: Marble, worked or not.	86	150	Italy 143; Argentina 7.
Sulfur:			
Crude	152,764	176,603	United States 124,570; France 38,538; Mexico 13,495.
Refined	198	393	United States 360; United Kingdom 23; France 5.
Other [8]	----------	31	

See footnotes at end of table.

TABLE 4.—Brazil: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Mineral fuels:			
Coal:			
Anthracite	17,016	817	United States 617; West Germany 200.
Bituminous	874,945	865,487	United States 840,828; Czechoslovakia 15,578; Poland 9,058.
Peat	----------	6	All from West Germany.
Coal coke	27,495	39,226	West Germany 30,637; United States 7,969; Belgium-Luxembourg 600.
Petroleum:			
Crude ---------- thousand tons	9,961	10,374	Venezuela 4,619; Saudi Arabia 3,001; Kuwait 1,293.
Refinery products:			
Gasoline ---------- do	419	523	Netherlands Antilles 204; U.S.S.R. 189; Rumania 45.
Kerosine ---------- do	86	17	Rumania 15; Netherlands Antilles 2.
Jet fuel ---------- do	152	237	Netherlands Antilles 138; Venezuela 55; Trinidad 44.
Distillate fuel oil ---------- do	38	54	U.S.S.R. 32; Venezuela 15; Netherlands Antilles 7.
Residual fuel oil ---------- do	124	----------	
Lubricants ---------- do	242	228	United States 183; Netherlands Antilles 28; Venezuela 17.
Liquefied petroleum gas ---------- do	249	262	Venezuela 199; Chile 23; Argentina 19.
Paraffin and vaseline ---------- do	22	18	United States 7; East Germany 5; Rumania 3.
Petroleum coke	7,531	5,216	All from United States.
Asphalt and asphalt mixtures.	3,534	29	Argentina 17; United States 7; United Kingdom 5.
Other refinery products	3,282	8,204	Netherlands Antilles 6,835; United States 1,263; United Kingdom 58.
Carbon black	6,538	4,449	United States 3,300; West Germany 754; France 130.
Mineral waxes	664	442	United States 362; East Germany 36; Republic of South Africa 14.
Mineral tar and crude chemicals from coal, petroleum, and natural gas.	21,108	29,154	United States 26,175; Belgium-Luxembourg 929; West Germany 863.

---

[1] Excludes jewelry and other ornamental items.

[2] Data not available by commodity or quantity except for 359 milligrams of radium, valued at $13,453, imported from Canada in 1963.

[3] Includes some materials not identified by commodity in source and commodities not listed separately in table.

[4] Includes emery, pumice, and diamond and other gem stone dust. Excludes millstones and grindstones.

[5] Excludes lithopone, which is listed under zinc.

Source: Serviço de Estatística Econômica e Financeira, Comércio Exterior.

COMMODITY REVIEW

METALS

Columbium.—The pyrochlore mine and mill of Distribuidora e Exportadora de Minérios e Adubos, S.A. (DEMA), at Araxá, Minas Gerais, were operated on a nominal basis during 1964, with most of the activity devoted to improving the pyrochlore concentrate grade from 55 percent to about 58 percent of Cb_2O_5 and to continued experimentation in production of ferrocolumbium. Small lots of both of these products were exported during the year for market testing. DEMA was especially desirous of developing its thermite-type ferrocolumbium process on a commercial scale because the ThO_2 and U_3O_8 content of the pyrochlore thus treated remains in the resulting slag and eliminates the special problems encountered in trying to export products containing radioactive components, The company's first large shipment of pyrochlore concentrate, cleared for export in 1963, contained approximately 10 tons of thorium oxide and 1 ton of uranium oxide which had to be reimbursed to the Comissão Nacional de Energia Nuclear (CNEN) in the form of South African yellowcake of an equivalent value.

At yearend DEMA had stocks of approximately 1,000 tons of pyrochlore concentrate on hand, and 1965 production was programmed for an average of 42,000 pounds of concentrate and 24,000 pounds of ferrocolumbium per month.

Iron Ore.—Total iron ore output for 1964 was officially reported as 16,972,276 tons, 51 percent more than in the previous year. Cia. Vale do Rio Doce (CVRD), the Government-controlled iron ore company, again led all other producers with an output of slightly more than 9 million tons (including 3.4 million tons of fines) of which 7.1 million tons (including 1.05 million tons of fines) was exported. Cia. Siderúrgica Nacional (CSN), also controlled by the Government, increased mine output of shipping ore almost 16 percent to nearly 1.4 million tons [4] but yielded second place to the privately run Belgo-Mineira interests which produced approximately 1.8 million tons of ore for self consumption and for export. Total production by private companies, Belgo-Minéira interests included, apparently was more than double that of 1963; however, available data did not indicate the extent to which inclusion of mined but normally unsalable fines might have inflated production statistics, particularly the total for 1964. Total iron ore exports by private firms other than Belgo-Mineira decreased slightly in 1964.

Inadequate rail transport and port facilities have been the principal factors limiting expansion in the private sector. Implementation of the Government's new iron-ore export policy eventually will provide a much greater export opportunity for producers who must move their ore through the southern corridor to the Port of Rio de Janeiro and new ports to be built on Septiba Bay. In the meantime, two new contracts signed in March 1964 have provided additional opportunity to two private groups for large-scale export of ore through the eastern corridor via the expanding railroad and port facilities controlled by CVRD.

The largest of these contracts was made with S.A. Mineração da Trinidade—SAMITRI and its parent company, Cia. Siderúrgica Belgo-Mineira, and supplements the contract signed in 1962. According to these contracts, SAMITRI has agreed to develop the necessary mining and processing capacity at the several large iron ore deposits that it now holds and at those to be acquired from the parent company to supply the CVRD transport system with 2 million tons of ore in 1968, 3 million tons in 1969, and 4 million tons annually thereafter. CVRD will have the right to acquire up to half of this ore for its own export commitments, while SAMITRI will be entitled to export the other half on its own account. The supplemental contract expressly provides for price considerations for various types of ore and acknowledges market areas for both parties which shall not be infringed upon without mutual consent. Company reports indicate that approximately 1,574,000 tons of SAMITRI ore was exported from Vitoria between August 1963 and yearend 1964; of the total, CVRD sold 840,000 tons and SAMITRI marketed the balance.

---

[4] The CSN annual report for 1964 did not give exact data on production of fines (in addition to shipping ore). In preceding years, output of fines was roughly equivalent to the firm's shipping ore output, but these fines were neither utilized nor saved.

The second new contract was with FERTECO S.A. Administração e Fomento Industrial and its iron mining subsidiaries Cia. de Mineração de Ferro e Carvão and Cia. de Mineração Serra da Moeda. Under this agreement, CVRD is obligated to construct a branch of its railroad to the iron ore deposits at Fabrica. Beginning January 1968, the FERTECO companies will utilize the new line to ship not less than 600,000 tons of ore annually to the CVRD port near Vitoria for private export to Rohstoffhandel G.m.b.H. and Hoesch A.G. in West Germany. The ore transport commitments by CVRD are subject to the additional purchase by Rohstoffhandel/Hoesch of equivalent amounts of CVRD ore up to the total purchase of 3 million tons annually.

During 1964, the several projects designed to improve and greatly expand capacity of the entire CVRD iron ore operation progressed according to schedule. Additional financing for these works was assured in November when the Inter-American Development Bank approved a loan of $28.8 million to CVRD. These funds are to be spent as follows: $5.6 million on equipment for new mining installations at the Conceição and Dois Corregos mines near Itabira; $4.9 million for railway equipment; $1.5 million toward completion of the new iron ore-coal port at Ponta do Tubarão near Vitoria, Espirito Santo; the principal sum of $16.5 million for construction of a plant at Tubarão to pelletize 2 million tons of iron ore fines annually; and the balance for supervisory services.

Iron and Steel.—Steel production capacity reached 4 million tons during 1964 despite serious financing and marketing problems. Business downturns in 1963 and 1964 caused a decline in domestic demand in the latter year which was only partially compensated for by an aggressive export promotion program. Although a study made by the Latin American Iron and Steel Institute (ILAFA) indicated that Brazilian steel prices were the lowest in Latin America in late 1964 and that an improvement in the internal market was anticipated for 1965, steelmakers sought ways of cutting costs and increasing exports, especially to other member countries of the Latin American Free Trade Association (LAFTA).

Nine integrated steel plants were in operation in Brazil thoughout 1964; three using coke accounted for about 56 percent of pig iron and ingot output, and six using charcoal accounted for about 30 percent. Cia. Siderúrgica Nacional (CSN), which operated the largest steel plant in Latin America, continued to hold the dominant position in the industry. CSN (coke) produced 956,600 tons of pig iron, 12 percent more than in 1963. Because of market retraction during the year, production of steel ingots by CSN was only 1,218,000 tons, 4 percent below the company's 1963 record. Cia. Siderúrgica Belgo-Mineira (charcoal), the second largest producer, increased pig iron output by 5 percent to 390,000 tons and steel ingot output by 6 percent to 421,300 tons. Usinas Siderúrgicas de Minas Gerais (USIMINAS) increased pig iron production 27 percent to 276,400 tons and steel ingot production 276 percent to 275,800 tons, and became the third largest Brazilian steel producer. Production of alloy and special steels accounted for about 10 percent of Brazil's total ingot output or approximately 298,000 tons during the year. CSN produced over one-third of the 2,408,000 tons of rolled iron and steel produced in 1964, and was the only company to make rails, tinplate, and galvanized plate. Cia. Siderúrgica Mannesmann remained the only producer of seamless steel pipe. Because of variations in the methods of compilation used by individual firms, production figures for steel semimanufactures were not additive by product. The Brazilian Iron and Steel Institute (IBS), established in 1963, undertook the difficult task of compiling industry rolled product statistics in 1964.

Apparent consumption of steel in Brazil dropped from 3.8 million tons in 1963 to less than 3.5 million tons in 1964, primarily because of slowdowns in construction, motor vehicle and machinery production, and metal working industries. Domestic production accounted for 86.8 percent of the apparent steel consumption during the year. Market studies made by the National Economic Development Bank (BNDE) and other authorities indicate that under favorable conditions consumption of steel should rise to about 7 million tons by 1970. The financing needed to increase capacity to that level was estimated by the Government in 1964 at the equivalent of Cr$900 billion. Generation of the funds needed to achieve economies of scale by raising production of the new plants beyond first-stage capacity will depend to a large extent on the interest of other countries in the development of Brazil. In general, however, the slow rate of return anticipated has deterred private foreign investment in the Brazilian steel industry despite its apparently large potential. Foreign capital is invested in significant amounts in only three established plants: USIMINAS, Mannesmann, and Belgo-Mineira; and in the Aços Anhanguera, S.A., plant under construction.

As a result of the combined influences of the business downturn and of Federal measures to stimulate interest in foreign markets as a destination for excess stocks, yearend data indicated expansion of iron and steel exports to almost 250,000 tons valued at $17 million, as compared with exports of 53,700 tons valued at $3.2 million in 1963. Argentina was by far Brazil's best customer for semifinished and finished products while Japan was the principal purchaser of steel ingots and cast or pig iron.

Imports of iron and steel have varied from year to year in quantity and value dependent on foreign exchange availability and other factors. The value of iron and steel imports in 1964, including scrap, dropped to $51,823,000 as compared with $87,267,000 in 1963. Japan, West Germany, and the United States supplied nearly 55 percent of the total while 23 other countries shared in the remainder of the Brazilian market. Continuing demand was forecast for imports of special steels, hot- and cold-rolled sheets, and medium and heavy shapes.

CSN's intermediate expansion plan got under way in 1964 with an Alliance for Progress loan of $5.5 million, supplier credits of $2 million, and direct CSN investment of $1.5 million. The intermediate plan is designed to raise ingot capacity from 1.3 to 1.5 million tons a year by 1967 and to double present tinplate capacity to 300,000 tons a year through installation of a second continuous electro-plating line.

This expansion is intended to lay the foundation for eventual production of 3.5 million tons of ingots.

Growth plans of Belgo-Mineira, the major producer of wire, are dependent upon funds becoming available for modernization of the rolling mills at Monlevade (including a Morgan mill to produce 250,000 tons of wire bar a year) and installation of a new sintering plant. Progress was made towards increasing capacity from 450,000 to 500,000 tons. The company was considering adoption of a fuel oil injection system to raise output of the firm's four 350-ton-per-day blast furnaces by 20 percent and reduce charcoal consumption by 30 percent.

Mineração Geral do Brasil, Ltda., the second largest charcoal iron and steel producer in 1964 and the largest of six firms in the Jafet group of São Paulo, was in serious financial difficulty at yearend, and it was anticipated that the furnaces would be shut down early in 1965. Mineração Geral was one of the leading producers of ferroalloys.

Cia. Siderúrgica Paulista (COSIPA), originally established by private interests in 1953, has had increasing financial and construction troubles that have resulted in several changes in management. According to the firm's annual report for 1964, investment in the first stage (500,000-ton capacity) had risen to Cr$495 billion by the end of 1964 and was expected to reach Cr$540 billion by the end of 1966. The company has received loans from the BNDE of more than Cr$250 billion which the bank may convert to equity thereby raising its participation from 61 percent to about 98 percent. During the year the company began producing steel plate and hot- and cold-rolled strips and coils from CSN ingots. In operation were a four-high, 110-inch plate mill; a 66-inch, five-stand hot-strip mill; and a four-high, 66-inch, three-stand cold-strip mill. COSIPA has the first rolling mill in South America with automatic thickness control and was the first producer in Brazil of fine sheet wide enough for automobile tops.

Cia. Ferro e Aço de Vitoria, planned by private interests in 1962 but now controlled by BNDE, produced 24,793 tons of bars and shapes for the São Paulo market, using billets shipped to Vitoria by USIMINAS and the CSN. The company's rolling mill has an annual capacity of 130,000 tons. The BNDE retained the Arthur G. McKee Co. to make a study of a fully integrated plant at Camburi, north of Vitoria with an initial capacity of 1 million tons of shapes per year. In November the Inter-American Development Bank approved a $1.3 million loan to finance this study.

Manganese Ore.—Indústria e Comércio de Minério, S.A. (ICOMI), one of the world's largest producers of manganese ore, maintained operations at its Serra do Navio Mine in Amapá at nearly the same rate that set a record in 1963. In 1965, the company made available production data for various stages of its operations covering the period 1959–64, and this information has clarified discrepancies in the official statistics reported for Amapá.

TABLE 5.—Salient production data, Serra do Navio manganese mine, Território Federal do Amapá, Brazil

(Thousand metric tons)

	1959	1960	1961	1962	1963	1964
Crude ore to washing plant	958.6	920.6	1,031.3	[1] 951.4	[1] 1,083.9	[1] 1,080.6
Low-grade ore (−35 percent Mn) to stockpile	32.5	98.7	253.4	197.9	161.6	161.7
Washed shipping ore (+48 percent Mn):						
Production	776.2	760.4	[1] 775.3	772.5	827.2	820.1
Exports	[1] 753.0	[1] 760.0	801.0	685.8	816.5	798.9

[1] Serviço de Estatística da Produção, used these figures to represent Amapá production in official statistics.

Reported output for other manganese-producing States during 1964 was as follows: Bahia 34,148 tons; Mato Grosso 42, 675 tons; and Minas Gerais 193,155 tons. These same States produced 28,078 tons, 60,744 tons, and 84,683 tons, respectively, in 1963. Decreased production at the Urucum Mine in Mato Grosso was necessitated by low water in the Paraguay River which limited export shipments to a total of only 14,864 metric tons. Production in Minas Gerais recovered strongly as Cia. Meridional de Mineração resumed normal operations at Morro da Mina and reported output of 91,293 tons for 1964. Other major producers in the State of Minas Gerais included Cia. de Mineração Novalimense, Cia. Siderúrgica Nacional (19,396 tons), and S.A. Mineração da Trinidade (local sales of 17,000 tons, averaging 33 percent Mn).

The United States continued to be the principal recipient of Brazilian manganese ores, but total exports so consigned decreased from 771,604 tons in 1963 to 541,376 tons in 1964. Most of this market loss was made up by export of 104,848 tons to the United Kingdom and by adding Japan and Norway to the customer list.

Uranium.—The first atomic fuel elements produced in Brazil were delivered to the Institute of Nuclear Engineering (Instituto de Engenharia Nuclear) in Guanabara by the Institute of Atomic Energy (Instituto de Energia Atômica) of São Paulo in November, signifying the attainment of an important milestone in Brazilian technological capability. The elements were made to fuel a new Argonaut reactor at the University of Brazil campus in Guanabara. Of the eight components delivered six contained uranium enriched to 20 percent U–235 and the other two contained natural uranium; total mass of fuel used was about 14 kilograms. Except for aluminum dust from France and enriched uranium supplied by the United States, the components were of Brazilian origin.

In addition to the new Argonaut reactor, Brazil has training and research reactors at São Paulo and Belo Horizonte and a critical facility at São Jose dos Campos, São Paulo.

NONMETALS

Aquamarine.—A find of rather large crystals of gem quality aquamarine was reported near Padre Paraiso in the municipality of Caraí, Minas Gerais. The largest crystal was 11 centimeters in diameter and weighed about 7 kilograms. Color of this stone varied from deep blue to almost colorless and its value was placed at approximately $143,000. Several other stones of good quality, ranging from 1 to 4 kilograms in weight, also were found at the same locality.

Diamond.—Mineração Tejucana, S.A., completed the prospecting and evaluation of extensive, low-grade diamond-bearing gravels along the Rio Jequitinhonha north of Diamantina, Minas Gerais, and decided to attempt large-scale recovery of the diamond and gold values by bucketline dredging. The company held five placer concessions covering an area about 200 meters wide for more than 100 kilometers along the river, and expected to obtain rights to work additional areas alongside these concessions. Plans called for moving a 12-cubic-foot Yuba dredge from a placer deposit in California to Brazil to initiate the operation. Modifications for diamond recovery will include installation of circular-type jigs similar to those used on dredges in Malayan tin fields; tests have indicated these jigs can effect a 94-percent recovery from the Jequitinhonha gravels.

The company has claimed that more than 500 million cubic yards of alluvial material in the area contain diamond values averaging approximately 28 cents per cubic yard, and it reportedly expected to encounter some small, rich areas with values of $5 or more. From top to bottom, the typical section of placer ground comprises loose sand (barren) up to 30 feet thick overlying a layer of loose round gravel and sand (also barren) about 2 feet thick, a zone of fine gravel up to 4 feet thick with some diamonds, and a bottom zone of heavy diamond-bearing gravel averaging 8.2 feet in thickness; the bedrock is reported to be decomposed.

Diamonds recovered from test pit operations usually were a fraction of a carat in size but stones up to 60 carats have been found. About 60 percent are of gem quality and the remainder are first quality industrial stones; bort is seldom found. Average value of the stones recovered through 1964 has been appraised at about $25 per carat. During the first full year of operation it was hoped that the 12- cubic-foot dredge could dig 3.3 million cubic yards of material which should yield about 37,500 carats of diamond worth approximately $938,000.

The major shareholders in Mineração Tejucana, S.A., are Pacific Tin Consolidated Corp. (U.S. interest), Brazil Mining & Dredging Co., Inc. (Guggenheim Brothers), and Dragagem de Ouro, S.A. (Brazilian and U.S. interests), each holding 26 percent of the shares while the remainder are divided among individual investors.

Refractory Products.—The Inter-American Development Bank announced a loan equivalent to $4 million to Magnesita, S.A., of Belo Horizonte, Minas Gerais, Brazil's largest producer of magnesite and a wide range of refractory products. The loan will help Magnesita carry out a two-stage, 3-year project designed to increase its production of refractory bricks, mixes, and sintered magnesite from 111,150 tons to 285,900 tons per year. Slightly more than half of the firm's capital outlay for plant and equipment will be used to expand magnesite mining and sintering operations near Brumado, Bahia, and for construction of storage and port facilities in the Salvador area. The balance of fixed capital expenditure will be applied to increasing capacity of the firm's refractory products plant at Belo Horizonte. Up to 92 percent of the Bank loan funds were earmarked for goods and services to be acquired abroad.

Salt.—Salt producers in most of the Northeast States and at Cabo Frio, Rio de Janeiro, suffered heavy losses in output during 1964, largely because of unusually frequent and heavy rains that affected evaporation in the salt ponds and also dissolved some of the salt in uncovered stockpiles. With national output down 37 percent from that of 1963, Brazil found it necessary to import large quantities of salt for the first time to help make up the shortfall. Brazilian consumption of salt actually had exceeded production for several years prior to 1964, the balance being supplied by withdrawals from stocks of more than 500,000 tons which had accumulated in the late fifties and by heavy imports of caustic soda and other basic chemicals that could have been produced locally if an adequate supply of cheap salt had been available.

The 1964 salt crisis also highlighted even more serious problems which plagued the industry and for which immediate solutions were not forthcoming, namely the archaic and inefficient methods employed by many producers, the inadequacy of handling and loading facilities at the main producing centers in the Northeast, and the competitively prohibitive cost of shipping Northeastern salt to southern consumers. The incidence of these problems on the salt supply is illustrated by a comparison of the cost of domestic and foreign salt landed at southern ports during the latter part of the year. The selling price of Northeast salt at the producer's lot was Cr$4,500 per ton, the cost of putting this salt aboard ship was Cr$8,500 per ton, and sea freight to Rio de Janeiro or Santos was Cr$17,000 per ton, making a total landed price of Cr$30,000 per ton for domestic salt. At the same time, German salt was being imported at a c.i.f. price of Cr$16,000 to 17,000 per ton (roughly US$13.50). With such a price differential, the domestic industry survived only because of government restrictions on imports.

A few of the larger producers have undertaken modernization of their facilities and should be able to increase their output considerably when the weather is favorable; however, it seems probable that massive imports of salt and salt-based chemicals will be continued until domestic cost factors can be adjusted substantially downward.

MINERAL FUELS

Liquid and gaseous mineral fuels again provided about 62 percent of all fuel-derived energy consumed in Brazil in 1964, while coal supplied about 7 percent of such energy and fuelwood and bagasse accounted for about 31 percent. In terms of total energy consumed, all solid and liquid fuels provided about 75 percent while hydropower accounted for about 25 percent.[5]

As in recent years, Brazil continued to depend on imports of mineral fuels, largely crude oil and coking coal, to supply a significant part of its total energy requirements. Nevertheless, petroleum remained one of Brazil's most valuable crude mineral products.

Coal.—Latest available reports placed the measured and indicated bituminous coal reserve in the States of Santa Catarina, Rio Grande do Sul, and Paraná at 2,704 million tons and the inferred reserve in these States at about 1,000 million tons. Santa Catarina remained the leading producing State in 1964, accounting for about two-thirds of the raw coal produced; Rio Grande do Sul produced most of the remainder, output from Paraná comprising only about 6 percent of the total.

---

[5] Converting electric power to standard coal equivalent at the rate of 1,000 kilowatt hours=0.6 ton of standard coal equivalent.

Most of the coal produced has a high ash and sulfur content and requires washing, which in the past has reduced the volume of cleaned coal to about 60 percent of mined raw coal. The ratio of steam to metallurgical coal is about 3 to 1. The latter is mixed with imported coal in a ratio of about 2 to 3 to produce suitable coke. Steel companies using coal to produce coke have been required by law to purchase a minimum of 40 percent national coal for their needs. Steam coal, used mainly for thermoelectric power generation, remained in excess supply. The Comissão do Plano do Carvão Nacional, the Government coal authority, continued to plan projects to increase steam coal utilization. A 100-megawatt thermoelectric powerplant at Tubarão, Santa Catarina, was under construction and scheduled for completion in 1965.

Petroleum and Natural Gas.—The Government oil entity, Petróleo Brasileiro, S.A. (PETROBRÁS), continued to dominate the petroleum industry. In addition to its monopoly on petroleum exploration and producing operations, PETROBRÁS assumed control of all imports of crude oil and petroleum derivatives as authorized under Decree No. 53,377 of December 24, 1963. Presidential Decree No. 53,982 of June 25, 1964, imposed additional conditions upon petroleum suppliers to Brazilian refineries, precluding PETROBRÁS from entering into crude oil supply contracts with any single supplier for more than 10 million barrels of crude oil and/or for delivereies for more than 12 months unless the supplier guarantees export of certain Brazilian commodities equivalent in value to 20 percent of petroleum imports. Regulations for administration of the decree were released on October 24, 1964, by the Exchange Department, Bank of Brazil; however, the new decree had little effect on traditional oil suppliers by yearend. On March 13, 1964, President Goulart signed a decree expropriating all privately owned Brazilian oil refineries. Following the ouster of the Goulart regime in April, no action was taken to seize the refineries. At yearend, the refineries continued to be operated by the private companies under court writ.

PETROBRÁS actively continued well-drilling operations and completed 233 wells with a total footage of 863,336 feet during 1964. Compared with 1963, total wells completed and footage drilled increased by 6.4 and 4.4 percent, respectively. Wells completed included: 135 development; 84 exploratory or stratigraphic; 12 water injection; and 2 water supply.

The drilling of 14 delineation wells and 3 development wells in the Carmópolis field, discovered in August 1963 in the Sergipe-Alagoas basin, confirmed this field as Brazil's most important oil find. On the basis of drilling completed by yearend, PETROBRÁS estimated 1.37 billion barrels of oil-in-place in the Carmópolis field. The oil, from the Cretaceous Muribeca formation at a depth of about 3,000 feet, has a gravity of 20° to 22° API. Exploratory drilling was conducted in other sedimentary areas but with little success. Of 70 wildcats drilled in 1964, only 12 found oil or gas. Discoveries were reported in Bahia at Massuí, Fazenda Imbé, and Jiribatuba in the

Reconcavo basin and at Sempre Viva, Querará, and Iraí in the Tucano basin.

Despite increased development well completions and secondary oil recovery operations, oil production averaged only 91,000 barrels per day in 1964, 6.7 percent less than in 1963. All production was from the Bahia fields, where 515 wells were producing at yearend. Natural gas production averaged 51.5 million cubic feet per day during 1964, an increase of 5.5 percent over that of 1963.

The proved crude oil and natural gas reserves of Brazil as of December 31, 1964, were reported[6] as 674 million barrels and 580 billion cubic feet, respectively.

The volume of crude oil processed and petroleum products produced by Brazil's three PETROBRÁS and six private refineries increased slightly during 1964. The PETROBRÁS refineries accounted for nearly 83 percent of the 310,530 barrels per day average crude oil processing rate. Crude oil imports, officially valued at an estimated $170 million, supplied 71 percent of total crude runs to the refineries. The Soviet Union became the third largest crude oil supplier to Brazil in 1964 with deliveries of a little more than 12 million barrels. On September 25, 1964, PETROBRÁS contracted with Soviet State trading authorities to increase Soviet crude oil shipments under existing barter arrangements to 28 million barrels in 1965.

SOURCE MATERIALS

This summary of developments relating to mineral matters in Brazil during 1964 is based mainly on official documents, reports, and statistical data published by various Brazilian Government agencies and on unclassified dispatches prepared by officers of the U.S. Embassy at Rio de Janeiro and U.S. Consulates in São Paulo and other key Brazilian cities. Supplementary information was derived from published annual reports of numerous companies operating in Brazil and from a wide range of other sources, including the following periodicals and trade journals: Banas Siderúrgica, 1964; Boletim do Instituto Brasileiro de Siderúrgica; Conjuntura Econômica; Engenharia, Mineração e Metalurgia; Fortnightly Review, Bank of London & South America, Ltd.; Metalurgia, Associação Brasileira de Metais; Revista Latinoamericana de Siderurgia; and Revista do Sindicato Nacional da Indústria do Cimento.

Trade statistics are those compiled by the Serviço de Estatística Econômica e Financeira of the Ministério da Fazenda. Basic sources for production statistics were Produção Mineral of the Serviço de Estatística da Produção of the Ministério da Agricultura and Annuário Estatístico do Brasil of the Conselho Nacional de Estatística (IBGE) for metals and nonmetals and the Conselho Nacional de Petróleo for crude and refined petroleum. In many cases, however, it has been necessary to use data and estimates derived from other official and unofficial sources too numerous to acknowledge specifically.

---

[6] Petróleo Brasileiro S.A. Relatório de Actividades, 1964. January 1965, p. 21.

The Mineral Industry of British Guiana

By Garn A. Rynearson[1]

⁂

THE role of the bauxite industry in the economy of British Guiana reached a peak of significance in 1964 as the total value of its export products attained a record high and surpassed that of the sugar industry for the first time. Unlike the sugar producers, the bauxite companies were not too seriously affected by politically engendered civil disturbances, adverse climatic conditions, or unusually low market prices for their products. Nonetheless, the general unrest that preceded yearend elections curtailed mining operations by the largest bauxite producer, Demerara Bauxite Co. Ltd. (DEMBA), and during midyear plant operations were hampered when more than 300 workers were forced to leave the Mackenzie-Wismar area temporarily. Although these difficulties resulted in an output level below that which had been anticipated, their net effect was minimized by a company decision which followed the crippling general strike of 1963 to give priority to the production of the more valuable bauxite products such as calcined abrasive- and refractory-grade bauxite and refined alumina.

The more modest bauxite operation of Reynolds Metals Co., registered a slight gain over the strike-reduced output of the previous year, but full recovery and potential expansion of its activities were delayed pending further negotiation of satisfactory long-term concession agreements and a definitive resolution of the problem of maintaining a deep-draft shipping channel through the bar at the mouth of the Berbice River.

In the minor sectors of mineral industry, the most notable new development was the initial exploitation of diamondiferous gravels in the upper reaches of the Potaro River.

GOVERNMENT POLICIES AND PROGRAMS

The year ended with a newly-elected government committed to restoration of civil order and economic progress to the country. Although the new administration had been seated for less than a month, it was evident that a concerted effort would be made to join racial and political differences and to renew confidence in the business community. It was expected that the new government would be receptive to proposals of companies seeking oil exploration concessions in the continental shelf area and that it would pursue a positive and aggressive policy in the development of other potentially significant mineral and hydroelectric resources.

---

[1] Physical scientist, Division of International Activities.

At yearend the Geological Survey and the Mines Division were transferred from the Ministry of Trade and Industry to the newly created Ministry of Forests, Lands, and Mines. Prior to 1963 mining was under the jurisdiction of the Lands and Mines Department of the Ministry of Natural Resources.

The mineral exploration project begun in 1962 by the Geological Survey with financial and technical assistance from the United Nations Special Fund continued during the year. Results of an aeromagnetic survey by Aero Service Corp. were made available through a set of maps covering two areas with a total of nearly 16,000 square miles. Results of a reconnaissance gravity survey of the Takatu basin in the northern savannas of the Rupununi District also became available.[2] This gravity work confirmed the existence of a graben-like structure containing sediments up to 20,000 feet thick in places, marking the basin as a potential area for future oil explorations.

Although geochemical prospecting by the Geological Survey for possible base metal deposits in the gold districts of the Cuyuni River region has indicated a number of areas with anomalously high copper values, diamond drilling of an anomaly in the Haimaralli Fall area did not encounter mineralization of commercial interest, and it was reported that the drilling operations would be shifted to the Aranka River area to test another copper anomaly.

The principal results of palynological studies of the coastal sediments and bauxite deposits of British Guiana were published in 1963 and 1964.[3] These studies were sponsored by the Geological Survey and received financial and technical support from the bauxite companies operating in British Guiana and Surinam. The results of the work represented a significant contribution to a better understanding of the stratigraphy and geologic history of the region, and the pollen zones that were established should provide a practical tool for guidance of exploration for concealed bauxite deposits. In addition, these zones should also prove very useful for correlation studies in connection with water and oil exploration.

PRODUCTION

Production of crude bauxite increased slightly more than 5 percent over the relatively low output of 1963, and British Guiana therefore maintained its rank as the world's fourth largest producer, leading France by only 83,000 tons. Diamond output also increased, but the recovery of gold diminished considerably, and production of manganese ore was the lowest since full-scale operations began in 1960. Official data are not available for the value of mineral commodities produced during the year, but the export value of alumina, bauxite, and manganese ore shipped and the estimated value of diamond and gold output total about $38.2 million[4] compared with corresponding figures of $34.5 million (roughly estimated) for 1963 and $37.5 million for 1962.

---

[2] Smith, D. M., and E. M. Andrew. Geophysical Surveys in British Guiana, March–April 1963. Overseas Geological Surveys, London, 35 pp. (issued in undated mimeographed form).

[3] Hammen, T. van der. A Palynological Study on the Quaternary of British Guiana. Leidse Geologische Mededelingen, v. 29, 1963, pp. 125–180.
Hammen, T. van der, and T. A. Wijmstra. A Palynological Study on the Tertiary and Upper Cretaceous of British Guiana. Leidse Geologische Mededelingen, v. 30, 1964, pp. 183–241.
Wijmstra, T. A., and T. van der Hammen. Palynological Data on the Age of the Bauxite in British Guiana and Surinam. Geologie & Mijnbouw, v. 43, No. 4, p. 143.

TABLE 1.—British Guiana: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity[1]	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Bauxite:					
Crude ore[2]	2,510,853	2,411,712	[3] 3,085,000	2,379,883	2,507,774
Dried bauxite products[4]	1,816,660	1,255,387	1,524,347	989,861	851,958
Calcined bauxite products[4]	311,883	376,712	374,516	370,395	470,413
Alumina[4]	-----	122,090	229,078	225,708	296,255
Gold troy ounces	2,364	1,702	1,903	[r] 2,848	2,111
Manganese ore and concentrate	124,696	[r] 196,136	275,454	142,728	118,757
Nonmetals:					
Diamond:[5]					
Carats	101,004	112,680	100,145	99,748	109,682
Number of stones	710,671	1,024,033	728,150	766,034	825,762
Stone, granite, crushed or broken	86,912	57,664	35,507	11,892	NA

[r] Revised. NA Not available.

[1] In addition to commodities tabulated, British Guiana produces clay, gravel, sand, and crushed or broken stone (other than granite) for construction purposes, but data on quantity are not available.

[2] Production on which royalties were collected by the Government. Data apparently not corrected for free moisture content of ore.

[3] Rounded figure based on data given in Colonial Office Digest of Statistics, No. 56, August 1964.

[4] Data for 1960–61 are official exports figures. Data for 1962–64 are company shipments reported by the U.S. Consulate General and Barclays Bank D.C.O. of Georgetown.

[5] Includes both gem and industrial. Approximately 55 to 60 percent of production is estimated to be of gem quality.

TRADE

Compilation of statistics on the foreign trade of British Guiana has been in arrears since publication of data for 1961. Although totals and a partial accounting of exports and imports for 1962 and 1964 have been published, neither totals nor detail of the trade for 1963 have been released officially. Available information indicates that the total value of exports of domestic goods has maintained a high and relatively constant level, being $93.4 million in 1962, an estimated $93 to $96 million in 1963, and $94.4 million in 1964, as compared with the previous high of $86.3 million in 1961. High world prices for sugar in 1963 helped to maintain the export level despite a decrease in the combined value of alumina and bauxite exports stemming from adverse effects of the general strike that year. In 1964, record exports of alumina ($15.5 million) and near-record exports of other bauxite products ($17.5 million) combined to offset a decline in sugar revenue (to $31.2 million) resulting from decreased production and falling sugar prices. Thus, in 1964, the bauxite industry became the most important source of domestic export goods for the first time, its products accounting for 35 percent of the total value of all exports. Exports of diamond during 1964 contributed about $2.6 million and manganese ore about $1.5 million to the export total. Other mineral and metal exports, principally gold and scrap metals, probably amounted to less than $200,000.

---

[4] Where necessary, values have been converted from British West Indies dollars (BWI$) at the rate of BWI$1.00 equals US$0.58.

Total imports apparently declined in value from $73.2 million in 1962 to an unofficially estimated $63 million in 1963 but recovered strongly in 1964 to attain a record high of $86.9 million. This import pattern reflects the economic decline that began after the elections of 1961 and the recovery that began after announcement that new elections would be held in 1964 under a revised electoral system.

Canada (alumina, bauxite, sugar) continued to be the principal consumer of British Guiana export products, receiving nearly one-third of the total in terms of value, followed by the United Kingdom (sugar, diamond) and the United States (sugar, bauxite, alumina, manganese ore, diamond). In recent years the Canadian market has tended to expand somewhat while the other major markets have diminished slightly. In 1964 British Guiana supplied alumina or bauxite to 26 countries.

Of the total value of all goods imported during the year, 33 percent was supplied by the United Kingdom, 23 percent by the United States, 11 percent by Trinidad and Tobago, and 9 percent by Canada.

COMMODITY REVIEW

METALS

Aluminum.—Demerara Bauxite Co. Ltd. (DEMBA), the British Guiana subsidiary of Aluminum Company of Canada, Ltd., produced and shipped 533,000 metric tons of dried bauxite, 463,000 tons of calcined bauxite (abrasive and refractory grades), and 292,000 tons of alumina during 1964. The company was able to maintain a relatively high level in overall output despite some unavoidable disruptions in its mining and processing operations. In addition, considerable progress was made in a $7.5 million program to expand production capacity.

DEMBA opened a new mine at the Kara Kara deposit east of Mackenzie. A new electrically powered Bucyrus-Erie 480–W walking dragline with a 15-cubic-foot bucket was acquired to strip overburden at this mine and a small (400 tons per hour) new bucketwheel excavator was put into operation at the Maria Elizabeth Mine. These heavy machines complement another 480–W dragline, two smaller (10-cubic-foot) 450–W draglines, and a large (1,000 tons per hour) bucketwheel excavator acquired previously. Another small excavator was to be added to the inventory of heavy mining equipment in the near future.

A new plant for producing "synthetic" mullite from bauxite was virtually completed by yearend and was expected to be operational early in 1965. The feed material will be agglomerated in two pelletizing machines before being fired through a rotary kiln. Capacity of the plant is rated at 50,000 tons per year. The final high-grade product is to be marketed for use as a refractory material.

New facilities for recovering part of the bauxite fines previously lost in washing plant tailings also were largely completed by yearend. These tailings reportedly contain up to 50 percent bauxite. The recovered fines will be suitable for use by the alumina plant. A selective settling circuit will be utilized to separate this bauxite from the clay and silica sand fractions of the tailings.

Aside from its mining and processing activities, DEMBA also was involved in a program to establish a local authority for the company-owned community of Mackenzie. To this end, the Greater Mackenzie Development Trust was founded with assets of BWI$3 million in cash and property provided by DEMBA. In addition to donating certain residential and commercial property to the Trust, the company began selling company-owned houses to employee tenants. It is planned that a civilian town council will gradually assume the administration of municipal affairs which heretofore have been managed by DEMBA.

The Reynolds Metals Co. mined from the Kwakwani area 271,975 metric tons of crude bauxite in 1963 and 314,780 tons in 1964. Company dried bauxite shipments of 300,695 tons (269,717 tons metallurgical grade and 30,978 tons chemical grade) in 1963 were raised to 312,603 tons (227,518 tons metallurgical grade and 85,085 tons chemical grade) in 1964, reflecting the successful capture of an increasing share of the market for chemical grade material. Average analyses of the two grades of bauxite were as follows:

Constituent	Percent[1]			
	Metallurgical grade		Chemical grade	
	1963	1964	1963	1964
Al_2O_3	59.9	57.0	61.3	61.1
Fe_2O_3	4.8	8.1	.8	1.0
SiO_2	3.2	3.0	4.9	4.2
TiO_2	2.3	2.3	2.3	2.3
Loss on ignition	29.8	29.6	30.7	31.4
Total	100.0	100.0	100.0	100.0

[1] Analyses exclude free moisture content.

Gold.—Production in the Northwest District doubled to 955 troy ounces but decreased from 1,111 to 624 ounces in the Mazaruni District, from 747 to 271 ounces in the Cuyuni District, and from 511 to 233 ounces in the Potaro District. Declared output in the Rupununi District continued to be almost insignificant, amounting to only 28 ounces. Inasmuch as most of the gold being produced in British Guiana is won by hand washing methods, no great increase in production may be expected in the near future unless the base metal prospecting and drilling program being conducted by the Geological Survey in the lode gold districts should discover new deposits that would warrant development under present economic conditions.

Iron Ore.—A press release issued by the Geological Survey reaffirmed the existence of a deposit of hematite discovered several years ago in the Upper Pomeroon area west of the Essequibo River estuary. Although the actual extent of the deposit has not been determined, a minimum reserve of 25 million tons is indicated. Details on occurrence were not revealed, but it appears to be by far the largest hematite deposit yet found in British Guiana. Extensive deposits of low to medium-grade laterite-type iron ore have been investigated in the Blue Mountains west of Saxacalli and in other parts of the country, and small deposits of magnetite occur in the Rupununi District; none of these have yet been exploited on a commercial scale.

NONMETALS

Diamond.—Total diamond output increased appreciably as new recovery operations along previously unworked stretches of the Potaro River above the Kopinang tributary nearly doubled the production of the Potaro District, offsetting decreased output in the Mazaruni and Cuyuni Districts. However, the high recovery level in the upper Potaro was not expected to be long-lived because of the relatively small volume of workable gravel in the area. The total number and weight of stones declared for each district during 1963 and 1964 were as follows:

District	Number of stones		Total carats	
	1963	1964	1963	1964
Northwest	-----	-----	-----	-----
Cuyuni	56,182	44,552	6,020	5,367
Mazaruni	588,184	553,066	77,744	75,277
Potaro	120,045	223,914	15,602	28,192
Berbice	-----	226	-----	78
Rupununi	1,623	4,004	382	768
Total	766,034	825,762	99,748	109,682

MINERAL FUELS

Petroleum.—No onshore or offshore petroleum exploration was reported during 1964. At yearend three applications for exploration rights to offshore areas were pending and it was expected that the new government would act on these proposals early in 1965.

British Guiana continued to depend entirely on imports to supply its growing need for mineral fuels, lubricants, and miscellaneous petroleum products. The total value of such imports increased from $7.6 million in 1962 to $8.4 million in 1964 but decreased to a little less than 10 percent of the total for all imports.

SOURCE MATERIALS

The information in this chapter has been drawn from both official and private sources. A large part is based on dispatches from the U.S. Consulate General in Georgetown and on official publications of the Government of British Guiana. The latter include monthly and annual trade publications of the Department of Customs and Excises and the Statistical Bureau of the Ministry of Development and Planning and statements on gold and diamond issued by the Mines Division of the Ministry of Trade and Industry. A report on 1963 activities of the Geological Survey Department published in the

Overseas Geological Survey's Annual Report for 1963 (London) provided a frame of reference in reviewing progress of the mineral exploration project.

Monthly issues of the Overseas Review and the 1965 annual of Overseas Survey published by Barclays Bank D.C.O., bimonthly issues of The Commercial Review published by the Chamber of Commerce of Georgetown, and a comprehensive article on the bauxite industry by J. J. Svec in the May 1964 issue of Brick & Clay Record were the principal unofficial sources consulted.

W. A. Swain of the Mines Division provided background information on government agencies concerned with minerals in British Guiana as well as supplemental information on developments in the mineral industry during the year of review.

The Mineral Industry of Chile

By Sumner M. Anderson[1]

◆

CHILE continued to be the world's only producer of nitrates from natural mineral sources in 1964. Copper, the most important single item in the Chilean economy, increased more than 4 percent in mine production and nearly 10 percent in smelter production over that of 1963, but the country dropped to third largest producer in the free world as a result of greater increases in Zambia. An indicated 34-percent jump in the output of molybdenite, a byproduct of the concentration of copper ores, easily held Chile in third place in the free world mine production of molybdenum. Production of iron ore, although relatively small in the world picture, continued its steady growth and gained importance in the export market, particularly to Japan. The magnitude of the major production items in Chile relative to total production in South America and in the free world was as follows in 1964:

Commodity	Share of total	
	South American production (percent)	Free world[1] production (percent)
Copper:		
Mine production	78	16
Smelter production	79	14
Nitrogen compounds:		
Natural nitrates	100	100
All types, including natural nitrates	67	1
Iodine	100	•45
Iron ore	21	3
Molybdenum	91	11
Bituminous coal and lignite	21	(2)

• Estimate.
[1] Excludes Communist countries, from which reliable production statistics are not available.
[2] Less than ½ unit.

The combined segments of the mineral industry—mining, smelting, refining, milling, mineral processing, and transporting—accounted for possibly 25 to 30 percent of the gross national product. Exports of metals and minerals and their products yielded $367.6 million in foreign exchange receipts equivalent to 83.0 percent of the total export earnings, whereas less than 10 percent of import expenditures were for metal and mineral products. An increase in total exports and a decline in total imports combined to give a favorable trade balance of $14 million.

---

[1] Chief Latin America specialist, Division of International Activities.

The total Chilean labor force in 1964 was about 2.5 million, of which only 2.6 percent was engaged in the mining industry; these figures do not include the unreported number of workers in the foundries, iron and steel plants, copper mills, cement, ceramic, fertilizer, and other mineral processing plants, all of whom comprise a part of those workers listed in Chilean sources as a part of the manufacturing sector.

Distribution of the labor force credited to the mineral extractive industry was as follows:

Metal mining:	
Copper	29,713
Iron	6,637
Manganese	613
Lead and zinc	201
Mercury	53
Other metals	212
Total	37,429
Nonmetal mining:	
Nitrate and iodine	10,931
Other nonmetals	3,142
Total	14,073
Mineral fuels:	
Coal	12,609
Petroleum	2,054
Total	14,663
Grand total	66,165

Labor strikes have significantly affected mineral industry output. In the three largest copper producing centers at Chuquicamata, El Salvador, and El Teniente, legal and illegal strikes, not counting the numerous work stoppages in the smaller mines, have resulted in the following losses in copper production:

Year	Metric tons		
	Illegal strikes	Legal strikes	Total losses
1960	3,845	36,999	40,844
1961	49,865	6,942	56,807
1962	10,289	13,740	24,029
1963	5,850	14,500	20,350
1964	8,895	13,500	22,395
Five-year total	78,744	85,681	164,425

Inflation appeared to be slowing somewhat on the basis of cost of living data. Consumer prices increased 38 percent in 1964 compared with 45 percent in 1963. The escudo lost ground with respect to the U.S. dollar by 26 percent in 1964 as against 35 percent in 1963. The exchange rate in December 1964 was E2.636 equals US$1 on the Bankers Market (buying rate) and E3.096 equals US$1 on the

Futures Market (used in most commercial transactions); year's averages were E2.372 and E2.741 equal to US$1 on Bankers and Futures Markets, respectively.

GOVERNMENT POLICIES AND PROGRAMS

The administration of the Christian Democrat party, which won the presidential election of September 4, 1964, announced plans for a more direct and extensive government role in major economic and industrial development projects, setting the future tone and direction for Chilean trade, industry, and investment. Initial emphasis was given to export expansion by way of a concrete proposal for doubling copper production and refining most of the copper domestically. Agreements were signed with the major copper companies designed to implement this proposal, which, however, were not to become effective until ratified in 1965 by the Chilean Congress, where strong opposition in the Senate was expected. Plans also included assigning cabinet level responsibility for coordinating export promotion activities in a new Ministry of Industry and Commerce, offering special export rebate incentives, and promoting economic and industrial integration among Latin American countries via direct Presidential efforts. Private initiative was to be favored generally, but the Government proposed to act directly on its own or jointly with private interests wherever such actions would expedite the economic development objectives.

The United Nations technical assistance staff of seven geologists, geophysicists, and mining engineers, coordinated with the Chilean Ministry of Mines and Institute of Geologic Investigations, completed the Atacama Province Mapping Project in June 1963 and started the Special Fund Project which by yearend 1964 had completed reconnaissance studies of about three-fourths of Coquimbo Province, leaving the eastern high Andean areas for completion in 1965. The work in 1964 included an aerial photographic survey and surface geologic mapping, geophysical and geochemical studies of mineralized zones, and 1,110 meters (3,642 feet) of drilling in 12 areas of special interest. The studies encountered several occurrences of copper, iron ore, molybdenum, fluorite, and pyrophyllite, and included special exploration for a possible extension of the Punitaque mercury deposit. A full evaluation of the most promising localities will be made by Chilean Government agencies at a later date.

On December 9 it was announced that the U.S. Alliance for Progress program would lend at least $125 million to Chile in 1965 for social and economic development, with possibilities of other forms of assistance to come later.

PRODUCTION

Of the 32 metals, minerals, and mineral fuels for which production was reported in 1964, all showed gains over 1963 except gold, refined lead, manganese ore, borates, common clay, phosphates, talc, and coke, none of which have ever attained major importance quantitatively.

TABLE 1.—Chile: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Metals:					
Copper, content of:					
Ore, concentrate, and precipitates, not further processed	31,630	26,396	35,723	[r] 64,995	43,169
Matte and slags	----------	62	----------	96	195
Blister	504,816	299,007	294,589	280,108	308,998
Refined metal		225,408	262,636	258,942	278,076
Total	536,446	550,873	592,948	[r] 604,141	630,438
Gold, content of:					
Gold ore and concentrate ... troy ounces	NA	8,904	10,682	21,793	3,835
Copper ore, concentrate, and metal ... do	NA	45,779	53,367	53,420	60,491
Lead ore ... do	NA	101	63	26	15
Silver ore ... do	NA	----------	----------	5	
Placer gold ... do	NA	198	71	113	27
Refined metal (other than in above) ... do	NA	1,517	826	1,937	1,155
Total ... do	54,367	[r] 56,499	65,009	[r] 77,294	65,523
Iron and steel:					
Iron ore ... thousand tons	6,041	6,987	8,092	8,507	9,853
Average iron content ... percent	63.00	63.03	63.69	64.43	64.40
Smelter and mill products:					
Pig iron ... thousand tons	266	285	383	418	437
Ferroalloys ... do	NA	NA	16	17	NA
Steel ingots ... do	422	363	495	489	544
Semifinished products ... do	269	302	413	442	474
Flat rolled products ... do	280	267	346	366	379
Pipe and structural shapes ... do	15	10	9	10	9
Lead content of:					
Ore and concentrate, not further processed	2,444	2,043	1,454	[r] 868	1,116
Smelter products	600	480	254	220	----------
Total	3,044	2,523	1,708	[r] 1,088	1,116
Manganese ore	[r] 45,898	[r] 31,762	43,162	46,480	20,366
Average manganese content ... percent	NA	45.62	45.50	44.26	NA
Mercury ... 76-pound flasks	2,876	1,509	791	613	267
Molybdenum concentrate:					
Gross weight	• 3,307	3,245	4,278	5,234	7,047
Content:					
Molybdenum sulfide (MoS_2)	3,089	3,054	3,977	4,842	6,502
Do ... percent	• 93.41	94.11	92.96	92.51	92.27
Molybdenum (Mo)	1,852	1,831	2,384	[r] 2,903	3,898
Do ... percent	• 56.00	56.41	55.73	55.46	55.31
Silver contained in ore and concentrate of:					
Silver ... thousand troy ounces	NA	----------	----------	4	----------
Copper (including blister) ... do	NA	2,129	2,261	2,710	3,040
Lead and zinc ... do	NA	23	10	39	8
Gold ... do	NA	5	5	15	
Total ... do	1,679	2,157	2,276	2,768	3,048
Zinc	1,051	162	496	[r] 505	1,154
Nonmetals:					
Barite	1,806	1,407	1,049	[r] 1,020	1,168
Borates: Ulexite, 33 percent B_2O_3	2,919	160	3,814	[r] 5,964	3,300
Cement, hydraulic:					
Portland ... thousand tons	835	883	1,022	1,166	1,267
Pozzolan ... do	50	57	109	129	141
Total ... do	885	940	1,131	1,295	1,408
Clays:					
Kaolin	7,800	14,151	30,464	36,899	45,940
Other	NA	NA	NA	[r] 25,675	17,083
Feldspar	1,113	2,317	1,156	[r] 424	561
Gypsum:					
Crude	• [r] 80,000	[r] 79,903	115,212	[r] 116,328	129,436
Calcined	• 32,165	34,811	[r] 33,554	[r] 47,893	53,289
Iodine	1,776	1,843	2,348	2,156	2,161
Lapis lazuli ... kilograms	5,800	3,200	9,100	[r] 3,100	5,300
Limestone • ... thousand tons	1,463	1,493	1,840	[r] 1,846	1,908
Nitrates:					
Sodium ... do	1,087	849	1,013	993	1,070
Potassium ... do	104	83	107	143	104
Total ... do	1,191	932	1,120	1,136	1,174

See footnotes at end of table.

TABLE 1.—Chile: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Nonmetals—Continued					
Phosphates:					
Apatite	17,537	13,924	12,492	13,909	13,138
Guano:					
Red	NA	13,210	12,132	18,248	11,464
White	NA	6,514	3,914	3,947	3,587
Total	18,221	19,724	16,046	22,195	15,051
Total phosphates	35,758	33,648	[r] 28,538	36,104	28,189
Quartz	[e] 5,077	91,490	[r] 58,713	[r] 80,380	94,145
Salt, common	42,672	46,112	51,013	[r] 48,242	109,252
Sodium sulfate	8,536	4,629	[r] 12,986	32,421	34,529
Sulfur:					
Refined and in caliche (sales)	31,397	44,700	[r] 69,386	[r] 51,237	43,878
Content of sulfuric acid	NA	NA	6,526	6,073	15,675
Total	NA	NA	[r] 75,912	[r] 57,310	59,553
Talc	[e] 314	1,865	1,901	2,582	2,360
Other	[1] 25,722	[1] 32,188	[1] 35,727	[2] 16,035	[2] 51,000
Mineral fuels:					
Coal, bituminous and lignite:					
Mine run thousand tons	[r] 1,471	1,764	1,855	[r] 1,719	1,789
Marketable do	1,365	1,622	1,723	1,664	1,677
Coke:					
Oven and beehive do	234	[e] 203	[e] 236	249	246
Gas house do	[e] 86	[e] 86	[e] 86	99	83
Natural gas (gross) million cubic feet	81,873	95,120	132,844	192,402	[r] 234,420
Natural gas liquids thousand 42-gallon barrels	161	247	519	1,017	1,221
Petroleum:					
Crude do	7,231	9,263	11,689	[r] 13,209	13,687
Refinery products:					
Aviation gasoline do	[r] 239	319	441	369	416
Motor gasoline do	[r] 4,471	[r] 4,676	[r] 5,899	5,679	6,068
Kerosine do	[r] 1,100	[r] 1,183	[r] 1,604	1,837	1,910
Diesel oil do	[r] 1,781	[r] 1,928	2,407	[r] 2,541	3,063
Residual fuel oil do	[r] 1,852	[r] 2,008	[r] 2,492	[r] 2,643	4,071
Liquid petroleum gas do	254	370	407	428	1,813
Solvents [3] do	25	30	44	39	129
Mineral turpentine do	40	47	45	61	26
Total do	[r] 9,762	[r] 10,561	[r] 13,339	[r] 13,597	17,496

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] Includes clay (other), iron oxide pigment, and silica sand.
[2] Includes iron oxide pigments and silica sand.
[3] White gasoline and naphtha.

TRADE

Exports and imports of metal and mineral products during 1962 and 1963 are presented herewith. Official trade data for 1964 were not available in time for inclusion in this volume, but preliminary export figures for some important items appearing in the Commodity Review section show continued growth of molybdenum shipments; a reversal of the 1963 decline in copper (with increases in blister and copper mill products overbalancing the decreases in concentrates, fire refined, and electrolytic), iron ore, zinc concentrates, and iodine; and further decreases in the export of manganese ore, mercury, nitrates, and coal. The only significant change in trade pattern since 1962 has been the displacement of the United States by Japan as the principal customer for iron ore. The United States remained the chief recipient of the bulk of metal and mineral exports, and shared with western Europe (particularly West Germany) domination of the market for Chilean imports except for petroleum products, most of which have been supplied by sources in Latin America.

TABLE 2.—Chile: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Copper:			
Ore and concentrate	33,765	34,522	Japan 26,529; West Germany 3,892; Sweden 2,180.
Scrap	139	---	
Cement	3,110	9,479	Spain 2,907; Japan 2,220; Belgium 1,879.
Precipitates	7,465	8,499	West Germany 4,320; Japan 4,179.
Oxide	191	---	
Slag, dross, and skimmings	---	3,028	United States 1,532; Spain 1,496.
Ingot and other primary forms:			
Blister	298,332	293,395	United States 206,777; United Kingdom 39,168.
Fire refined	74,227	79,516	United Kingdom 32,468; Italy 15,196; West Germany 8,672.
Electrolytic	169,051	168,804	Netherlands 37,566; United Kingdom 29,715; Sweden 25,718.
Alloys	462	---	
Semimanufactures:			
Unalloyed:			
Bars and rods	53	70	Colombia 49; Uruguay 13; Peru 5.
Plates and sheets	119	121	Peru 32; Colombia 23; Viet-Nam, undifferentiated, 23.
Wire	3,252	1,948	Argentina 1,333; Colombia 245; Uruguay 235.
Pipes and tubes	406	245	United States 76; Costa Rica 50; Colombia 45.
Alloyed	253	326	United States 222; Venezuela 75; Colombia 15.
Gold, gold-copper, gold-silver, gold-silver-copper, and gold-silver-lead ore and concentrate.	35,475	66,140	West Germany 18,117; Belgium 8,554; Japan 6,794.
Iron and steel:			
Iron ore ... thousand tons	7,246	7,092	Japan 3,612; United States 2,523; Italy 333.
Pig iron	370	---	
Ferroalloys	13,777	11,081	United States 10,825; Peru 160; Colombia 48.
Semimanufactures	17,381	30,088	Brazil 14,681; Argentina 13,162; Uruguay 1,785.
Lead ore and concentrate	1,721	1,908	West Germany 1,351; Belgium 557.
Manganese ore and concentrate	9,879	4,725	West Germany 2,880; United States 1,651; Netherlands 195.
Mercury ... 76-pound flasks	1,063	388	United States 229; Argentina 115; Brazil 29.
Molybdenum concentrate	5,130	5,939	West Germany 2,721; United Kingdom 1,127; Netherlands 1,038.
Silver-copper and silver-lead ores and concentrates.	17,996	38,426	Sweden 34,337; West Germany 2,075; Switzerland 1,350.
Zinc:			
Concentrate	105	99	All to Belgium.
Slag	154	---	
Nonmetals:			
Borates:			
Calcium	100	---	
Sodium	---	160	All to Uruguay.
Cement	30	8	All to Peru.
Clays:			
Refractory	51	---	
Type not specified	2	---	
Iodine	2,278	1,758	United Kingdom 286; West Germany 179; Netherlands 159.
Lapis lazuli ... kilograms	10,903	3,775	Italy 1,583; United States 722; France 700.
Nitrates:			
Potassium	67,743	91,724	United States 52,717; Brazil 15,103; Australia 3,310.
Sodium	843,161	805,265	United States 347,886; Spain 108,924; Brazil 25,304.
Salt, common:			
Crude	---	1,200	All to Peru.
Refined	400	500	All to Peru.
Sodium carbonate	58	---	
Sodium sulfate	---	880	All to Brazil.
Sulfur	641	525	All to Peru.

TABLE 2.—Chile: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Mineral fuels:			
Coal	1,118	1,033	Bolivia 953; Argentina 80.
Coal briquets		5	All to Brazil.
Coal tar, or pitch		11	All to Ecuador.
Coal tar products (oils and greases)	1,107	1,097	Mainly to Argentina.
Natural gas liquids: Propane	17,568	37,745	Argentina 19,348; Brazil 17,901; West Africa 496.
Petroleum refinery products:			
Diesel oil	15	68	All to United States.
Lubricating oil	21	7	Uruguay 5; Bolivia 2.

Source: Comercio Exterior, Años 1962 y 1963, Dirección de Estadística y Censos, Santiago, Chile.

TABLE 3.—Chile: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Ingots	1,273	3,092	United States 2,151; Canada 847; France 76.
Filings		39	United States 29; Canada 10.
Semimanufactures	442	258	United States 129; West Germany 49.
Antimony, all forms	8	53	United Kingdom 51; Belgium 1; United States 1.
Arsenic, metallic	(1)	2	France 1; United Kingdom 1.
Bismuth, all forms		5	Mainly from West Germany.
Cadmium, all forms	(1)	1	All from Mexico.
Chromium, all forms	13	39	Norway 22; France 15; Sweden 1.
Copper and its alloys, semimanufactures.	10	13	United States 4; West Germany 4; United Kingdom 3.
Gold, semiwrought and wrought. troy ounces	4,827	8,105	West Germany 8,038; Belgium 64; United States 3.
Iron and steel:			
Slag, dross, and skimmings	64	257	United States 228; West Germany 29.
Pig iron	20	7	All from United States.
Ferroalloys	68	8	France 5; United States 2; West Germany 1.
Blooms, billets, and slabs	77		
Bars	9,538	4,779	West Germany 1,739; Belgium 1,126; United States 1,017.
Structural shapes and sections	3,281	2,916	West Germany 1,505; Belgium 840; United States 318.
Plates and sheets:			
Uncoated	5,744	8,477	West Germany 3,480; United States 2,173; Japan 618.
Galvanized	2,363	1,104	West Germany 540; Belgium 332; United States 140.
Terneplate	2	30	All from United States.
Tinplate	3,490	731	France 205; United States 172; United Kingdom 130.
Straps and hoops	390	329	West Germany 172; Belgium 62; Japan 42.
Special alloy iron and steel	2,259	1,264	West Germany 662; United States 145; Austria 128.
Lead:			
Ingot:			
Unalloyed	735	1,561	United States 641; Peru 596; Mexico 300.
Alloyed	35	20	All from Mexico.
Semimanufactures		124	United Kingdom 86; United States 32; Belgium 3.
Magnesium, unwrought	(1)	(1)	All from West Germany.
Mercury 76-pound flasks	3	14	United States 7; West Germany 4; United Kingdom 3.
Molybdenum, all forms	5	1	Mainly from United Kingdom.
Nickel:			
Ingots	5	41	Norway 15; France 5.
Electrolytic, in pieces	14	64	Canada 33; France 14; Norway 12.
Semimanufactures		22	United States 15; United Kingdom 4; West Germany 2.
Platinum, all forms troy ounces	9,715	211	West Germany 156; United Kingdom 32; United States 23.
Silver, all forms do	85,276	53,320	Peru 52,923; United States 397.

See footnote at end of table.

TABLE 3.—Chile: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Tin:			
Ingots long tons	580	612	United Kingdom 491; Singapore 54; United States 47.
Tin and tin alloys do		(1)	Mainly from United Kingdom.
Zinc:			
Ingots	3,581	5,322	United States 3,896; Peru 1,004; Mexico 220.
Semimanufactures	110	305	United States 151; Belgium 71; West Germany 59.
Other ores and concentrates, not elsewhere specified.	103	51	Mainly from Australia.
Other metals, not elsewhere specified	10	14	Sweden 7; Norway 5; United States 1.
Nonmetals:			
Abrasives:			
Emery and carborundum	17	172	United States 70; West Germany 64; France 15.
Pumice		(1)	Mainly from West Germany.
Other	94	95	United States 58; West Germany 29; United Kingdom 8.
Asbestos	4,632	9,392	Canada 7,255; United States 883; United Kingdom 263.
Cement	8,866	11,365	West Germany 1,328; Venezuela 1,250; United States 768.
Chalk	57	6	Mainly from United States.
Clays:			
Refractory	1,280	1,432	United States 826; West Germany 363; Argentina 204.
Kaolin	115	295	United States 222; United Kingdom 43; Argentina 30.
Other, not elsewhere specified	1,908	1,509	United States 983; West Germany 483; Italy 30.
Diatomite	495	812	United States 724; Mexico 46; West Germany 42.
Dolomite	10,660	11,749	United States 10,710; Belgium 470; Argentina 390.
Feldspar	18	21	Argentina 16; United Kingdom 5.
Fertilizers:			
Guano	1,953	2,022	All from Peru.
Potassic	12,347	15,255	West Germany 8,821; France 3,188; Belgium 542.
Phosphates	92,669	149,779	United States 55,582; West Germany 41,250; Belgium 37,613.
Superphosphates	59,732	76,390	United States 59,878; West Germany 7,936; Portugal 7,329.
Fuller's earth	957	429	Argentina 372; United States 42; West Germany 10.
Graphite	47	147	West Germany 98; United Kingdom 30; United States 10.
Gypsum	5	4	West Germany 2; United Kingdom 1; United States 1.
Lime	23	11	Mainly from Netherlands.
Magnesite:			
Raw	20	53	United Kingdom 41; West Germany 11; United States 1.
Calcined	3,637	3,461	United States 2,640; Austria 410; Netherlands 170.
Mica	32	23	United Kingdom 10; West Germany 4; India 3.
Mineral wool	58	(1)	Mainly from United States.
Quartz	60	12	West Germany 9; United States 3.
Salt	24	23	United States 22; West Germany 1.
Sand	203	397	West Germany 135; United Kingdom 107; United States 93.
Stone, dimension:			
Marble	41	(1)	Mainly from United States.
Other	51	144	Belgium 125; United States 19.
Talc	54	279	Argentina 167; Italy 92; Brazil 12.
Other nonmetals, not elsewhere specified.	1,982	3,771	United States 3,233; Argentina 272; Republic of South Africa 107.

See footnote at end of table.

TABLE 3.—Chile: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Mineral fuels:			
Coal:			
Anthracite	1,009	3	All from United States.
Bituminous	118,593	103,395	All from United States.
Coke, metallurgical	229	347	All from United States.
Petroleum:			
Crude	974,575	954,375	Venezuela 437,650; Curaçao 315,833; Trinidad 103,025.
Refinery products:			
Gasoline:			
Aviation	10,639	607	Peru 565; Curaçao 42.
Motor	19,562	12,813	Curaçao 10,475; Netherlands 2,069; Peru 267.
Kerosine	43,744	73,028	Curaçao 67,784; Netherlands 2,827; Peru 2,391.
Diesel oil	112,892	142,573	Peru 67,366; Curaçao 38,113; United States 20,204.
Fuel oil	54,645	12,120	Netherlands 5,353; Curaçao 4,444; Venezuela 858.
Lubricants, including greases	12,370	15,125	United States 12,881; United Kingdom 872; Curaçao 566.
Asphalt	234	1,428	Spain 635; United Kingdom 441; United States 322.
Paraffin	5,647	13,582	United States 6,800; Indonesia 4,612; United Kingdom 1,308.
Other	149	370	United States 222; Netherlands 128; West Germany 11.

[1] Less then 1/2 unit.

Source: Comercio Exterior, Años 1962 y 1963, Dirección de Estadística y Censos, Santiago, Chile.

COMMODITY REVIEW

METALS

Copper.—By far the outstanding politico-economic event in the Chilean mining history so far in this century was the 1964 initiation of a new era of "Chileanization" of the copper industry, following the presidential election on September 4 in which the principal defeated candidate had promised, if elected, to nationalize the dominantly foreign-owned segment of the industry. The more moderate early action of the winning candidate and newly inaugrated President Eduardo Frei Montalva was to negotiate agreements involving five leading copper companies: The Kennecott Copper Corp. subsidiary Braden Copper Co.; The Anaconda Company subsidiaries Chili Exploration Co., Andes Copper Mining Co., and Chile Copper Co.; and the Cerro Corp. subsidiary Cía. Minera Andina, S.A. All agreements were signed before the end of the year but could not become effective unless ratified by the Chilean Congress, which was to consider them in 1965.

The Kennecott agreement provided for transfer of the business and properties of the Braden Copper Co. to a new Chilean corporation to be known as Sociedad Minera El Teniente, S.A. (El Teniente Mining Co.), in which the Chilean Government will purchase a 51 percent interest for $80 million. Kennecott will retain a 49 percent interest and operate the property. The $80 million purchase price will be loaned to the Chilean Government by Kennecott and amortized over a 20-year period. The $80 million plus $20 million to be loaned by the Chilean Government and an additional $100 million from international lending agencies will finance an expansion program to increase production from 163,600 to 254,000 metric tons annually. Benefits to the company were expected to be the increased production and a reduction of tax rate from about 85 percent of profits (the highest of any copper enterprise in the world) to 44 percent, with a long-term guarantee of stabilization.

The Anaconda agreement included no government stock sharing in existing Anaconda subsidiaries but provided for: (1) 25 percent government ownership in a new Compañía de Cobre Exótica S.A (75 percent Anaconda) contemplated to develop and mine the Exótica ore body near Chuquicamata, containing 1.35 percent copper in an estimated 153 million tons of ore to be treated on toll by Chile Exploration Co.; and (2) 49 percent government ownership in a joint exploration company in which 51 percent will be held by one or more of the Anaconda subsidiaries. Exploitation of deposits determined to be of commercial size and grade by the exploration company will be by new companies jointly owned and financed by the Government and Anaconda companies in optional percentages. This agreement also provides for a total investment of approximately $123 million by Anaconda and $12 million by the Chilean Government to effect by 1970 increases by Anaconda subsidiaries of 53 percent in the output of copper to 555,650 tons annually, 100 percent in the output of molybdenum to 7,800 tons annually, and more than 140 percent in total electrolytic copper refining capacity to about 446,800 tons annually. Agreement was reached on stable and equitable tax treatment and operating terms and joint direction of commercial policies under which copper and molybdenite will be marketed. Procedures were outlined for developing maximum utilization of Chilean products in construction and operations, and for studies to determine the feasibility of copper fabrication in Chile.

The Cerro agreement provided for 75 percent ownership by the Cerro Corp. and 25 percent by the Chilean Government in Minera Andina, S.A., a company newly formed to develop and operate the Rio Blanco mine. This mine is located some 65 kilometers (40 miles) northeast of Santiago at an altitude of 12,000 feet in the heaviest part of the Andean snow belt. The ore body contains an average of 1.58 percent copper plus minor amounts of molybdenum in 121 million proved tons of greatly altered and shattered andesite porphyry that lends itself to mining by the block-caving method. The deposit was discovered circa 1840 and worked briefly about 1865, but because of its situation was bypassed by many companies until 1954 when the Cerro Corp. acquired a majority interest in the property from Cía. Minera Rio Blanco Ltda. Since then Cerro has spent $9.6 million in development work which will be credited to its share of a total $81 million project investment designed to provide for production at a rate of 59,000 tons of copper annually by late 1969. Of the $81 million project cost, $31 million will be spent in the United States and abroad for equipment and services; the rest will go to construction costs in Chile and working capital. Credits totaling $45 million will be sought from lending agencies in the form of long-term loans guaranteed by the Chilean Government, which will purchase debentures on an equal basis with the Cerro Corp. The agreement provides for Andina to pay income tax at a rate of 15 percent, plus a 30 percent tax on dividends that will go to Cerro over a 20-year franchise period. Heavy snows in the mine area during the winter months offer a definite danger of avalanches and require employment of a snow control supervisor and special techniques of operation. As designed, the block-caved ore, after underground crushing, will be transported by belt conveyor 5.4 kilometers through a tunnel to an underground flotation plant in Rio Blanco Canyon, from which the concentrate sludges will be carried by gravity pipeline 45 kilometers to the town of Los Andes where they will be dewatered and then moved by rail to the port of Las Ventanas on Quintero Bay, 25 kilometers north of Valparaiso. At first, possibly less than half of the concentrate will be fed to the new government-owned Las Ventanas smelter and refinery and the remainder exported, but the tonnages processed to metal at Las Ventanas will be increased gradually at competitive costs. Andina intends to employ some 1,500 workers during the development of Rio Blanco and about 1,000 after regular production has been attained. Low-cost power for the project will be supplied under special contract by Empresa Nacional de Electricidad S.A. (ENDESA), the Chilean national power company, in return for a payment of $1.5 million by Andina on the signing of the contract.

By means of these agreements and a stimulated increase of 100,000 tons annually from the medium and small producers, the Government plans for Chile to reach a copper production target of over 1 million tons annually by 1970. Production in 1964 was distributed as follows:

TABLE 4.—Distribution of Chilean copper production, 1964 [p]

(Metric tons)

Producer	In untreated ore, concentrate, precipitates, and other crude forms	Blister	Fire refined	Electrolytic	Total
Chuquicamata smelter and refinery [1]	---	110,250	---	177,834	288,084
Potrerillos smelter [2]	---	76,475	---	---	76,475
Caletones smelter and refinery [3]	---	86,313	78,833	---	165,146
Total large operations (Gran Minería)	---	273,038	78,833	177,834	529,705
Montos Blancos smelter and refinery [4]	---	---	21,409	---	21,409
Paipote smelter [5]	---	18,053	---	---	18,053
Chagres smelter [6]	---	14,407	---	---	14,407
Las Ventanas smelter [5]	---	3,500	---	---	3,500
Small and medium mines	43,364	---	---	---	43,364
Total small and medium producers	43,364	35,960	21,409	---	100,733
Total Chile	43,364	308,998	100,242	177,834	630,438

[p] Preliminary.
[1] The Anaconda Company: Chile Exploration Co.
[2] The Anaconda Company: Andes Copper Mining Co.
[3] Kennecott Copper Corp.: Braden Copper Co.
[4] Mauricio Hochschild y Cía.: Empresa Minera de Montos Blancos S.A.
[5] Chilean Government: Empresa Nacional de Minería (ENAMI).
[6] Société Minière et Metallurgique de Peñarraya: Cía. Minera Disputada de las Condes S.A.

The sharp decrease in output of unsmelted products and the slight production decline in electrolytic copper were more than offset by production increases in all other smelter products, giving a 2.8-percent increase in total copper production over that of 1963. As a result of the extraordinary demands made by the three Chilean fabricators, 1964 Gran Minería[2] overseas deliveries of copper in primary forms dropped 6 percent in response to a 396 percent jump in deliveries to the domestic industry for processing on toll and subsequent export by the Gran Minería in semifabricated and fabricated forms. Because of the great disparity during most of 1964 between producers' price quotations and the London Metal Exchange price levels, Chilean copper fabricators found it profitable to purchase electrolytic copper from U.S. producers, submit it to a simple semifabricating process, and sell the product to U.S. or European consumers at prices based partially on the higher LME quotations. Chilean laws stipulating that domestic fabricators can obtain all the raw metal they require from the producing companies make this speculative trade possible.

At Chuquicamata 28.8 million tons of ore and 22.2 million tons of waste were mined to produce the 43-percent concentrate from which the blister and electrolytic copper were extracted. Essentially all the blister copper was exported to the United States, with roughly half reexported after refining there.

The Potrerillos smelter derived its blister from 6.3 million tons of ore mined chiefly at El Salvador mine, where a new ore handling system was initiated which was designed to extract larger ore blocks and reduce secondary blasting and intermediate haulage. Production of blister copper was retarded by a 50-day strike in February and March. In December the company completed the first stage of its electrolytic refinery that when completed will be able to produce 2,700 tons of electrolytic copper monthly.

The Caletones smelter and refinery was fed 570,091 tons of 32.33-percent copper concentrate milled from 10.4 million tons of ore mined at El Teniente. The total smelter output was at its highest since 1960, and the average daily mine-mill throughput was the highest on record.

Largest of the Mediana Minería (the medium copper operations) was at Montos Blancos, which produced a record 21,409 tons of high-purity and high-conductivity copper by a chemically modified fire refining process, plus 3,142 tons of copper in cements and 181 tons of copper in slag. The oxide-chloride-silicate ore from the mine is treated by a complex process of leaching, precipitation, and pelletizing before smelting and refining in Lurgi short drum rotary furnaces. Empresa Nacional de Montos Blancos S.A. broadened its activities in 1964 by taking an option on the Huitinquipa copper deposit in northern Chile and buying a minority interest in the largest Chilean sulfur producing company, Sociedad Azufrera Aucanquilcha.

Cía. Minera Disputada de las Condes S.A., second largest of the "Medianas," operated the Chagres smelter to process nearly 60 percent of the concentrate produced by the company's Disputada and El Soldado mines. The Disputada mine milled 1.2 million tons of ore to produce 51,200 tons of 32.48-percent copper concentrate, of which

---

[2] The large mineral operations in Chile.

30,306 tons was exported, and El Soldado mine milled 603,000 tons of ore to produce 35,300 tons of 30.21-percent copper concentrate, of which 6,512 tons was exported. Total exported concentrates contained 11,723 tons of copper, about 37 percent of all copper exported from Chile in that form. The 49,952 tons of concentrate sent to Chagres yielded 14,407 tons of blister copper of 99.2-percent purity. The company engaged in a major expansion program at its Disputada mine about 50 kilometers northeast of Santiago, and between January and December raised its monthly production rate for ore from 76,000 to 130,000 tons, and for concentrates from 3,583 to 6,046 tons.

The Santiago Mining Co. produced 25,681 tons of 26.96-percent copper concentrate from 274,000 tons of oxide and sulfide ores taken from its La Africana mine. Until midyear the concentrate presumably went to the Government-owned Paipote smelter for conversion to blister. After July 1 all the concentrate produced was sent to the new government-owned Las Ventanas smelter, operated by Empresa Nacional de Minería (ENAMI). The smelting unit of the plant, adjacent to the naval station on Quintero Bay, went on stream on September 30. Initialy output will be limited to 25,000 to 30,000 tons of blister annually. The installation took 5 years to build, at a cost of $20 million. Construction was started on the electrolytic refining unit of the complex, designed for an annual output of 84,000 tons of electrolytic copper with capacity for future expansion.

The "Pequeña Minería," or small segment of the copper industry, divided the disposal of its products between exports and shipments to the Paipote smelter, in unreported proportions. The principal elements of this segment of mining were as follows:

(1) Chile Canadian Mines S.A. which began operations in March 1964 as a subsidiary of Noranda Mines Ltd. of Canada and produced in the remaining 9 months 1,667 tons of copper contained in 2,954 tons of concentrate.

(2) Sociedad Minera Andrómeda Ltda., a Japanese company, which produced from the Andrómeda mine for export to Japan 999 tons of copper contained in 1,507 tons of copper cement.

(3) The Mantos de La Luna operation which was taken over from Cía. Cuprifera Mantos de La Luna S.A. by Wells-Chile Overseas Ltd. on October 15. The total 1964 production was 678 tons of copper contained in 1,025 tons of copper cement.

(4) The Aconcagua complex of Victor Rojas A., located on the Sierra Gorda 140 kilometers (87 miles) northeast of Antofagasta, where concentrates containing 388 tons of copper were produced and sold to ENAMI.

Various smaller mines and some copper byproduct of gold and lead mining contributed to the output of the "Pequeña Minería."

Gold.—Seventy-six percent (50,023 troy ounces) of the gold produced in 1964 was contained in blister copper and an additional 16 percent was in other products of copper mining. This byproduct gold closely followed the 4-percent increase in the production of copper, a gain that was more than nullified by a 79-percent drop in output from medium and small gold and gold-silver mining in the provinces of Antofagasta (Taltal area), Coquimbo (Illapel area), and Atacama (Copiapo area). Precious metal mines and placers (plus an insignificant recovery from lead ores) supplied 31 percent of the Chilean gold production in 1963, and only 8 percent in 1964.

Iron Ore.—Iron ore production continued a growth that has been uninterrupted for 5 consecutive years and maintained an average grade of over 64.4-percent iron.

Bethlehem-Chile Iron Mines Co. was the only producer which disposed of part of its output domestically, by sale of 700,000 tons to Cía. de S.A. Acero del Pacífico in compliance with its legal obligation to supply the ore requirements of the Chilean steel industry. Distribution of the 9.1 million tons of ore exported by producers was as shown on table 5. A comparison with the preceding year has shown a sharp drop in shipments to Italy (323,000 tons in 1963), significant increases to West Germany, Argentina, and the Netherlands (249,000 tons, 178,000 tons, and 15,200 tons respectively in 1963), and a consolidation of Japan's position as the leading market for Chilean iron ore. Total exports in 1964 exceeded estimates made in the early part of the year, and reached a tonnage valued at slightly more than $64 million—second only to that of copper.

Cía. Minera Santa Fe (owned jointly by Chemicals Phillip Corp., Canadian Foreign Oil Development Corp., and Chilean and American stockholders), with its wholly owned subsidiary Cía. Minera del

TABLE 5.—Chile: Exports of iron ore by companies and countries of destination, 1964

(Metric tons)

	Japan	United States	West Germany	Argentina
Cía. Minera Santa Fe	944,394	1,160,523	593,371	259,911
Cía. Minera del Pacífico [1]	185,863			
Cía. Minera San Andreas [2]	491,617			
Subtotal	1,621,874	1,160,523	593,371	259,911
Cía. de Acero del Pacífico	1,691,570	910,457		
Bethlehem-Chile Iron Mines Co	1,246,646	430,924		
Cía. Minera de Atacama Ltda	616,433			
Cía. Minera Santa Barbara	191,378	169,326		
Cía. Minera de Exportación (COMINEX)	13,099	32,536		
World Commerce Corp. (Santa Barbara)	7,464			
Montana, Cía. de Metales y Minerales				
Total	5,388,464	2,703,766	593,371	259,911

	Netherlands	Canada	Italy	Total
Cía. Minera Santa Fe	59,021			3,017,220
Cía. Minera del Pacífico [1]				185,863
Cía. Minera San Andreas [2]				491,617
Subtotal	59,021			3,694,700
Cía. de Acero del Pacífico	35,451	46,183	22,647	2,706,308
Bethlehem-Chile Iron Mines Co				1,677,570
Cía. Minera de Atacama				616,433
Cía. Minera Santa Barbara				360,704
Cía. Minera de Exportación (COMINEX)				45,635
World Commerce Corp. (Santa Barbara)				7,464
Montana, Cía. de Metales y Minerales	5,702			5,702
Total	100,174	46,183	22,647	9,114,516

[1] Santa Fe subsidiary.
[2] Owned 60 percent by Santa Fe and 40 percent by Santa Barbara.

Pacífico, derived a major share of Chilean iron ore production from the Carmen and smaller La Suerte, Cerro Negro Norte, Bella Ester, and Cristales mines in the Chañaral and Copiapó districts of Atacama Province and the El Pleito and El Dorado mines in Coquimbo Province, plus the major share of the output from the Cerro Iman mine of Cía. Minera San Andreas which is 60-percent owned by Santa Fe. Production of the combined holdings was nearly a third higher than the 2.85 million tons produced in 1963. Carmen, the principal mine, is equipped to produce over 1 million tons a year.

Ore from the Carmen and La Suerte mines moved through the port of Chañaral, and Bella Ester and Cerro Negro Norte ore moved through the port of Caldera. El Dorado ore is shipped from Guayacan. Ore from the Pleito and Cristales mines went to the port of Cruz Grande or Caldera.

Cía. Minera Santa Fe continued detailed study of its El Laco iron-ore deposits near the Argentine border, the least accessible and potentially the largest in Chile. Recent reserve figures have not been released, and the company had no immediate plans for development of a mine at that property.

Cía. de Acero del Pacífico earned $500,000 more profit from its Algarrobo mine operations than it realized from its entire steelmaking complex at Huachipato. Geological development, which continued throughout the year, revealed that ore reserves in the Algarrobo area are substantially higher than formerly evaluated—perhaps exceeding 60 million tons. The increased reserves were believed to justify plans for a 32-percent increase of production to 3,723,000 tons in 1965, most of which has been committed by sales contracts. Engineering, drilling, and blasting of Penoso Hill within the Algaborro property was begun in March 1964 on contract with Wells (Chile) Overseas, Ltd. The contract expired in October 1964, at which time Acero del Pacífico took over transportation of the ore to the crusher plant. A drilling program also was initiated to explore magnetic anomalies appearing in the Añanuca and Alcaparra areas.

A letter from Compañía de Acero del Pacífico, S.A. (CAP) has submitted the following revisions to statements made about that company on page 261 of the Bureau of Mines Minerals Yearbook 1963, Volume IV, Area Reports: International:

Ownership, as of June 30, 1965	Shares, at US$1.00 par value	Percent
Corporación de Fomento de la Producción (Chilean Government)	15,500,000	24.4
Caja de Amortización (Chile, autonomous)	6,800,000	10.7
Cía. Industrial Comercial Pacífico Sur (Chilean corporation)	4,800,000	7.6
Koppers Co. (U.S.A.)	3,700,000	5.8
Chile Exploration Co. (U.S.A.: Anaconda Copper Mining Co. subsidiary)	3,300,000	5.2
Cía. Sudamericana de Vapores (Chilean corporation)	2,700,000	4.2
Cía. Salitrera Anglo-Lautaro (U.S.A.)	2,200,000	3.5
Braden Copper Co. (U.S.A.: Kennecott Copper Corp. subsidiary)	1,700,000	2.7
First National City Bank (for various U.S.A. corporations)	1,300,000	2.0
Various holders of less than a million shares each	21,533,519	33.9
Total stock subscribed and paid	63,533,519	100.0
Total authorized capital	65,000,000	

Also the statement that CAP exports included ore purchased by ENAMI (Empresa Nacional de Minería, a Chilean Government agency) was incorrect, and CAP has its own coke plant and pipe mills at the Huachipato steel plant, not "at another site" as erroneously stated.

Bethlehem-Chile Iron Mines Co. (a subsidiary of the Bethlehem Steel Corp. and the only iron mining company categorized in the Gran Minería grouping) was the third largest iron ore producer in 1964. Production increased nearly 40 percent over that of 1963 to 2.43 million tons in 1964, of which 2.18 million tons was from El Romeral mine and 252,000 tons was scavenging production at the old El Tofo property. Both properties are in the area of La Serena, Coquimbo Province. El Romeral ore assayed 64.44-percent iron and that of El Tofo 67.2 percent. Exports were shipped through the ports of Guyacan and Cruz Grande. Bethlehem-Chile purchased 23 additional 30-ton trucks and 2 new 6-cubic-yard shovels for the purpose of expanding production at El Romeral to 3.5 million tons in 1965. El Tofo production is expected to stay at about its 1964 level with installation of a new magnetic separator in early 1965.

Cía. Minera de Atacama Ltda., owned by the Mitsubishi Mining Co., produced solely for export to Japan from its Adrianitas mine north of Copaipo, Atacama Province. This property was purchased in 1959 for $1.5 million. The ore is trucked 56 kilometers to modern loading facilities at the company port of Calderilla, near Caldera.

Cía. Minera Santa Barbara produced 368,000 tons of ore with a grade of over 60-percent iron, most of which presumably was from its 40-percent ownership of Cía. Minera San Andreas, which operated the Cerro Iman mine. Internal difficulties prevented activity a significant part of the year in the principal Huantemé mine northwest of Vallenar, Atacama Province. If plans of Santa Barbara to obtain additional properties should be successful, production in 1965 should reach 1.335 million tons.

Cía. Minera de Exportación mined its ore from properties in La Serena Department of Coquimbo Province. Sources of the 5,700 tons of ore exported by Montana, Cía. de Metales y Minerales, have not been identified.

Cía. de Acero del Pacífico, which also operates the only major steel plant in Chile, pushed extraction of ore from its Algarrobo mine southwest of Vallenar, Atacama Province, to a record 2.83 million tons in 1964, compared with 2.66 million in 1963, despite loss of an estimated 52,800 tons occasioned by a 5-day illegal strike in September. The difference between production and export shipments represents excess fines rejected in accordance with the specifications of sales contracts, and stockpiled at the port of Guacolda, near Huasco, for future beneficiation. Production of iron ore at Algarrobo totaled 2.83 million tons in 1964, reported by grades as follows, in metric tons: Lump—1.39 million; blast furnace—1.36 million; and premium smalls—85,000.

The Government agency Corporación de Fomento de la Producción (CORFO) conducted exploratory drilling of the Chañar-Boqueron deposit north of Vallenar, Atacama Province, and has given a preliminary estimate of 70 million tons of high grade iron ore reserve. Investigations are expected to continue throughout 1965 before the deposit can be completely described. It is believed that government exploitation of the property will give Chile its first underground iron mine, although no information has been released concerning the mining method to be adopted. Interest in purchasing the mining rights has been expressed by several overseas companies, but the Government was known to favor a concession arrangement for a long-term lease to the property.

Lead.—At yearend the only significant lead mine still active in Chile was Las Chivas property on Lago Buenos Aires, operated since July 1963 by the CORFO subsidiary Empresa Minera de Aisén as a result of the inability of the owner, Cía. Minera de Aisén, to earn a profit. It is not known to what extent the CORFO operation represents a government subsidy of this mining operation. In 1964 the mine produced 254 tons of high grade ore and 1,300 tons of concentrate, with a combined average grade of 62.6 percent, amounting to 973 tons of contained lead. An additional 143 tons of lead was contained in ores and concentrates from scattered mines in the Provinces of Tarapacá, Antofagasta, and Atacama.

Sucesión Federico Blanc, owner of the lead mine near Ovalle in Coquimbo Province, experienced financial difficulty and closed down both its mine and Dos Rios smelter during the year. (The lead smelter of Cía. Minera de Aisén has not operated since 1959.) Lead ores and concentrates produced were sold to the Government enterprise ENAMI, which exported most of it to West Germany and small quantities to the Netherlands and Belgium.

Manganese.—The abrupt reduction in output of manganese ore was brought about by suspension of the U.S. program of bartering surplus agricultural products for Chilean ferromanganese, and unless the program is resumed the high production tonnage of 1963 is likely to remain unchallenged for some time. Cía. Manganesos Chile, one of the two major companies that contributed to the 1963 record, closed operations at its mine in the Department of Elqui, Coquimbo Province, in April 1964, and Cía. Manganesos Atacama S.A. remained the only significant producer from its mines in the Corral Quemado district, Department of Ovalle, Coquimbo Province. Operations there were maintained with difficulty, and mainly by hand methods, from thin seams of high-silica ore containing an average of 45 percent manganese; by September the production rate had been reduced to only 700 tons per month. During the year approximately 1,200 tons were produced by various smaller mines in Coquimbo and Atacama Provinces.

Manganese ore that was not exported (approximately 16,800 tons) was converted to ferromanganese in the Coquimbo furnaces of Cía. Manganesos Atacama S.A. and the ferromanganese units of Fabrica Nacional de Carburo y Metalurgia at Concepción and Santiago.

The contract of the latter company for supplying the steelmaking requirements of Cía. de Acero del Pacífico is expected to assure continuance of ferromanganese production at least to that extent. The Coquimbo plant has operated traditionally for only part of the year because of seasonal power shortages.

Mercury.—Los Mantos de Punitaqui gold-copper-mercury mine of Cía. Minera Tamaya S.A., south of Ovalle, Coquimbo Province, continued to be the sole mercury producer in Chile. In addition to mer-

TABLE 6.—Chile: Manganese exports in 1964 [p]

Destination	Quantity (metric tons)	Value (U.S. dollars)
Manganese ore		
West Germany	3,395	113,072
Netherlands	126	2,515
Total	3,521	115,587
Ferromanganese		
United States	5,273	715,307
Peru	176	21,358
Uruguay	139	18,258
Colombia	38	5,450
Total	5,626	760,373

[p] Preliminary.

cury, of which only 35 flasks were exported (all to Argentina), the company produced from 13,597 tons of mixed ores 142 tons of distillation residues containing 9.7 tons of copper and 469 troy ounces of gold. A shortage of exploitable ore had threatened to close the mercury phase of the operation, but high world prices for the metal made possible at least temporary continuation. At yearend the company estimated a remaining ore reserve of only 8,000 tons, but geophysical work by the United Nations Special Fund team had found promising indications of additional mineralization and the company was exploring new localities beyond its current workings. The exploration was financed by a loan from CORFO.

Molybdenum.—Chilean molybdenum output exceeded that of the previous year for the third consecutive year. Concentrate production, entirely as byproduct of copper production by the Gran Minería, and concentrate content both in terms of molybdenum sulfide (MoS_2) and molybdenum metal (Mo) was reported as follows:

Producer	Mine	Quantity (metric tons)					
		1963			1964 [p]		
		Concentrate, gross weight	Content		Concentrate, gross weight	Content	
			MoS_2	Mo		MoS_2	Mo
The Anaconda Company:							
Chile Exploration Co.	Chuquicamata	2,489	2,273	[r] 1,363	3,132	2,861	1,715
Andes Copper Mining Co.	El Salvador	1,410	1,323	[r] 793	1,828	1,688	1,012
Kennecott Copper Corp.:							
Braden Copper Co.	El Teniente	1,335	1,246	[r] 747	2,087	1,953	1,171
Total		5,234	4,842	2,903	7,047	6,502	3,898

[p] Preliminary. [r] Revised.

Sources: 1963—Anuario de la Minería de Chile, Año 1963, Ministerio de Minería, Santiago. 1964—The Anaconda Company and Kennecott Copper Corp.

Production of the molybdenum sulfide concentrate was achieved by a selective flotation process developed in Utah in 1936 and perfected, largely by the Braden Copper Co., to effect an 85- to 90-percent recovery of the molybdenum sulfide in the porphyry copper ores. The process was installed at El Teniente in 1939 to process ores containing 0.06 to 0.07 percent molybdenite, at Chuquicamata in 1958 to process ores containing 0.03 percent MoS_2, and at El Salvador in 1959 to process ores containing about 0.04 percent MoS_2. Through 1964, the copper ores of Rio Blanco and Disputada de Las Condes were not being processed to recover molybdenum.

Moreover, no economic process has yet been developed to recover molybdenum oxide minerals such as lingrenite, wolfenite, ferromolybdite, powellite, and others that may contain as much as 50 percent of the total molybdenum content of the ore. Thus, as much as half or more of the total molybdenum content of copper ores produced in Chile in 1964 was not recovered.

Distribution of exports, in terms of contained molybdenum, was as follows:

Country:	*Metric tons* *1963*	*1964*
West Germany	1,327	1,788
United Kingdom	476	814
Sweden	434	532
Netherlands	487	528
France	145	185
Japan	-----	137
Total	2,869	3,984

In November 1964, the Government announced plans to place administration of molybdenum production and sales under the supervision of the Copper Department to assure that its exploitation will conform to the national interest. It also announced that increasing quantities of molybdenum concentrates will be directed to domestic processors and fabricators in order to provide molybdenum products of greater export value. In 1964 molybdenum concentrates containing 72 tons of metal were retained for domestic pilot plant experiments in the production of ferromolybdenum.

Rhenium.—Molybdenite concentrates produced at Chuquicamata contain 230 grams of rhenium per ton, those of El Teniente contain 440 grams, and those of El Salvador 570 grams per ton. These concentrates are not known to be utilized for the recovery of rhenium in the United States, where all the rhenium produced comes from southwestern U.S. molybdenite concentrates ranging in rhenium content from 12 to 1,650 grams per ton. However, the United States imports rhenium metal powder from West Germany, which receives most of the molybdenum concentrates shipped from Chile and which may be deriving its powdered rhenium from them. As industrial interest and demand for this rare metal increase, the rhenium contained in Chilean molybdenite concentrates may be expected to become increasingly significant. Rhenium is used as an additive in tungsten alloys to lower the ductile-brittle transformation temperature, impart ductility, and allow the tungsten and molydenum alloys to be worked at room temperature with standard metal forming equipment.

Silver.—Preliminary figures showing an 11-percent increase over 1963 in the production of silver to a Chilean record 3,047,679 troy ounces do not, as they might appear to, reflect the stimulus of high silver prices. Virtually all (99.7 percent) of the production was a byproduct of copper production, with approximately 77 percent from Gran Minería operations and 22 percent from the copper output of medium and small mines. (The small remainder was byproduct of lead-zinc and gold mining). The 11-percent increase may be accounted for by the 4.4-percent increase in the production of copper, which contains 4.6 to 4.8 ounces of silver per ton. By far the largest part of the silver produced leaves Chile contained in copper metal, and is not separately identified in official export statistics. It is to be expected that the projected rise in copper production will be accompanied by an increase in silver output although as demonstrated above, not necessarily in directly proportionate quantities.

Zinc.—The CORFO subsidiary Empresa Minera de Aisén, which administers Las Chivas lead property on the north shore of Lago Buenos Aires, also administers the Puerto Cristal zinc mine in the same area of Aisén Province. In 1964 the company produced zinc concentrate containing 1,005 tons of zinc. The concentrate was shipped to Belgium for conversion, and 85 percent of the refined metal product was returned to Chile for local consumption. Unidentified sources yielded 149 tons of zinc in forms other than as concentrate.

NONMETALS

Barite.—The Copiapó mine of Sociedad Minera Godoy, Schwenger y Cía. in Atacama Province remained Chile's principal barite producer in 1964, accounting for 908 tons, or 84 percent of total production. Output from Copiapó contained 98 percent $BaSO_4$. Minor producers were Las Mazas mine of Industria Minera Vassali (192 tons), Quebrado lo Choapa mine of Pompilio Raggio (10 tons), and unidentified workings of Sr. René Canales, a new producer (58 tons).

Most of the output has been sold domestically to Empresa Nacional de Petróleo for use in drilling muds, and to Industrias Bellavista S.A. for the manufacture of pigments.

Borax.—Borax Consolidated Ltd. continued operations throughout the year as the only active producer of borax ore in Chile. The company's El Loa mine produced from the Ascotán deposit in Antofagasta Province 6,028 tons of crude ulexite mineral which was upgraded to 3,300 tons of commercial grade ore containing 33 percent B_2O_3. Production supplemented by withdrawals from stocks remaining at the end of 1963 provided domestic sales of 4,075 tons; none was shipped abroad. The company at yearend had no plans to alter the 1964 level of production.

The Anglo-Lautaro Nitrate Co. initiated the test production of such byproducts as sodium sulfate and boric acid. Pilot plant production of these materials was started, and the target figure for commercial production of boric acid was set at 250 tons annually, to supply high-boron fertilizer for domestic market.

Cement.—In 1964 Chile established a new record of portland cement production for the fourth consecutive year. The 9-percent increase over 1963 output was shared by the Huachipato plant of Cemento Bio-Bio in Concepción and the Polpaico plant of Cemento Cerro Blanco del Polpaico, S.A. (northwest of Santiago) which installed a second Lepol kiln with accessory milling equipment. The country's largest and only other cement producer, Empresa Industriales "El Melón" S.A., completed modernization of its La Celera plant (Valparaiso Province) with the installation of its ninth kiln but was held to a production of about 613,000 tons—the approximate 1963 level of output—by a lengthy strike.

In addition to portland cement, pozzolan cement was manufactured by one company, Cemento Cerro Blanco del Polpaico, S.A., utilizing a porous material derived from volcanic ash.

Government plans for housing and industrial construction were expected to provide a further increase of cement production in 1965.

Clays.—The Chilean Ministry of Mines data on production of clays have been compiled from questionnaires sent to known significant producers, but these, although accounting for a sizable part of total output, operate only a small portion of properties being worked. Available data on kaolin output and consumption in 1964 was as follows:

Producer:	*Metric tons*	*Use*
Cemento Cerro Blanco del Polpaico S.A.	17, 517	For cement production.
Cía. Pigmentos Iriber, at Rosario Lo Solis, in the Santa Cruz area.	16, 335	1,089 tons for paper manufacture, 531 tons for the rubber industry, and the balance unspecified.
Refractarios Lota-Green	8, 114	Not reported.
Pompilio Raggio; Quebrada de Chapa mine, Valparaiso Province.	220	Not reported.
Industria Minera Vassali; Las Mazas mine, Valparaiso Province.	560	Not reported.
Other (estimate of Ministry of Mines)	3, 194	Not reported.
Total	45, 940	

Similar 1964 data on output and consumption of undifferentiated types of fire clay, predominantly from high-grade beds underlying the coal horizons at Coronel and Concepción, were as follows:

Producer:	*Metric tons*	*Use*
Fundo Playa Negro, at Coronel (approximate).	11, 600	6,620 tons delivered to Cía. de Acero del Pacífico steel plant; 4,980 tons delivered to Refractarios Lota-Green.
Refractarios Chilenos (approximate):		
From Montenegro, Tiltil, Cauquenes, and Curanilahue mines.	900	Not reported.
Purchases from small producers	3, 500	Not reported.
Subtotal	4, 400	
Other small producers (estimate of Ministry of Mines).	1, 083	Not reported.
Total	17, 083	

Feldspar and Quartz.—The Chilean Ministry of Mines records feldspar and quartz output only by major producers and makes estimates for the balance of output. The reported producers of these commodities in 1964 were as follows:

Producer	Mine	Province	1964 production (metric tons)	
			Feldspar	Quartz
Sr. José Bazzurro G	Quillota	Valparaiso	449	
Sociedad Producturo de Cuarzo Tilama	Illapel	Coquimbo	96	10,901
Industria Minera Vassali	La Maza	Valparaiso	16	
Braden Copper Co	El Teniente	O'Higgins		58,115
St. Antonio Soti	Not reported	Not reported		10,017
Others	do	do		15,112
Total			561	94,145

Gypsum.—Record production of Chilean gypsum in 1964 was reported as follows, compared with that of 1963:

Producer	Location	Province	Production (metric tons)			
			1963		1964	
			Crude	Calcined	Crude	Calcined
Cía. Industrial El Volcan	Cajón del Maipo	Santiago	115,869	47,506	87,600	33,289
Industria de Yeso Romeral Ltda.	Romeral	Coquimbo	459	387	35,000	20,000
Yeso Sociedad Meura	Not reported	do			6,836	
Sociedad Minera Yesera de Colima.	do	Santiago				
Total			116,328	47,893	129,436	53,289

Cía. Industrial El Volcan sold 32,200 tons of gypsum to local cement producers; the remainder of its production was used in its own building material plant at Puente Alto. A small part of the output of Industria de Yeso Romeral and presumably all that of Yeso Sociedad Meura and Sociedad Minera Yesera de Colima went into the production of cement.

A continued high level of construction activity in 1965 was expected to maintain gypsum production at not less than the 1964 levels.

Iodine.—Iodine production in 1964, as in the 2 preceding years, was maintained at approximately a capacity level. However, Chile's share of the world production dropped to an estimated 45 percent because of increased production in Japan. Output by companies was as follows:

Producer:	*Metric tons*
Cía. Salitrera Anglo Lautaro	1,973
Empresa Salitrera Victoria	153
Cía. Salitrera Iquique (Oficina Alemania)	21
Cía. Salitrera P. Perfetti (Oficina Flor de Chile)	14
Total	2,161

Exports by destination in 1964 were as follows:

Destination:	*Metric tons*
United States	833
United Kingdom	287
France	170
Germany (undifferentiated)	163
Netherlands	85
Czechoslovakia	73
Italy	55
Mainland China	53
Argentina	52
U.S.S.R.	30
Mexico	23
Switzerland	20
India	19
Belgium	17
Spain	12
Uruguay	8
Brazil	5
Pakistan	2
Portugal	2
Peru	1
Total	1,910

Lapis Lazuli.—Cía. Minera Flor de Los Andes-Carén, operating the only active lapis lazuli mine in Chile or—so far as is known—in the Western Hemisphere, concluded a sales agreement with a New York firm for 10,000 kilograms of the stone. Deliveries probably will extend into 1966. Exports in 1964, with quantities in kilograms and values in U.S. dollars, were to Hong Kong—1,800 ($5,400), Italy—1,500 ($4,719), West Germany—1,200 ($3,250), and United States—800 ($2,123); exports totaled 5,300 kilograms, worth $15,492, for a value per kilogram of $2.92.

The export total is the only available indicator of salable material hand sorted from 16,500 kilograms of ore mined in 1964.

Limestone.—Limestone producers are located from Antofagasta to Magallanes, but by far the largest portion of production is that of three producers whose output in 1963 and 1964 was as follows:

Producer:	*Metric tons* *1963*	*1964*
Cemento Cerro Blanco del Polpaico S.A	764,472	773,434
Empresa Industriales "El Melón" S.A	742,945	701,901
Cía. de Acero del Pacífico	196,819	240,000
Total	1,704,236	1,715,335
Approximate percentage of Chilean total	92	90

In 1964 all the production of Cemento Cerro Blanco del Polpaico S.A. was used for the manufacture of cement, caustic lime, hydrated lime, and calcium carbonate by the company. That of Empresa Industriales "El Melón" S.A. was for its own cement manufacture only. Cía. de Acero del Pacífico shipped 123,000 tons of limestone from its quarry on Guarello Island in Magallanes to its steel mill at Hauchipato for use as flux; the remaining 117,000 tons was sold to Cemento Bio-Bio and IANSA, a sugar manufacturer. The needs of the steel plant were expected to rise to 180,000 tons in 1965, when an overall increase in limestone production was anticipated to support the continued high level of activity in the construction industry.

Of total domestic production in 1964, 1,565,000 metric tons were reportedly consumed by the cement industry, 260,000 tons by other industrial users, and 82,500 tons by agricultural consumers.

Nitrates.—Unusually high demand spurred the Chilean nitrate industry to its greatest production level since 1959; increased output of sodium nitrate transcended a decline in the relatively minor production of potassium nitrate which sells normally at a $10-per-ton premium over sodium nitrate. Total nitrate production in 1964 was by four companies as follows:

Producer:	*Metric tons*	*Percent of total*
Cía. Salitrera Anglo Lautaro:		
Pedro de Valdivia	631, 584	53. 8
María Elena	297, 010	25. 3
Coya—solar evaporation	75, 312	6. 4
Total	1, 003, 906	85. 5
ENAMI: Empresa Salitrera Victoria	124, 204	10. 6
Cía. Salitrera Iquique; Alemania	32, 533	2. 8
Cía. Salitrera Pedro Perfetti; Flor de Chile	13, 426	1. 1
Total Chile	1, 174, 069	100. 0
Sodium nitrate	1, 070, 362	91. 2
Potassium nitrate	103, 707	8. 8

The dominant Anglo-Lautaro Nitrate Co. (Cía. Salitrera Anglo Lautaro) was the only producer operating without governmental assistance. Its pelletized product has found preferred market acceptance over the crystallized nitrates produced by the other three companies. Anglo-Lautaro continued to modernize its mining and plant operation, and started pilot plant production of sodium sulfate and boric acid.

The Government-owned Empresa Salitrera Victoria used the modern Guggenheim process of nitrate recovery but did not produce the pelletized product preferred by consumers. Cía. Salitrera Iquique at its Oficina Alemania and Cía. Salitrera Pedro Perfetti at its Oficina Flor de Chile employed the less efficient and older Shanks process and have maintained themselves in existence only through continued government assistance.

Governmental encouragement of the domestic use of nitrate fertilizers, by means of rebates to Chilean consumers and improvements in the internal distribution system, was largely responsible for a 3-percent decline in exports, which were distributed throughout the world as follows:

Destination:	*Metric tons*
United States	373, 872
Spain	140, 817
France	52, 050
Netherlands	46, 409
Brazil	34, 609
Denmark	29, 700
Yugoslavia	28, 255
Belgium	24, 335
Mexico	15, 515
Japan	12, 200
Mainland China	12, 052
Argentina	11, 260
India	11, 090
United Kingdom	10, 553
Peru	9, 160
Other:	
Central and South America	3, 701
Europe	14, 886
Near East	6, 917
Unreported	30
In transit: Held in Europe; final destination not fixed	46, 706
Total	884, 117

Phosphates.—Cía. Salitrera de Tarapacá Antofagasta remained the only active Chilean producer of apatite. In 1964 the company mined 13,100 tons of apatite assaying 26 percent P_2O_5 from its deposits at El Arrayán, Los Barros, and El Pingo in Atacama Province and Los Escobas in La Serena Department of Coquimbo Province. All production was used at the company's plant in Coquimbo for the manufacture of 15,305 tons of fertilizer containing 20 percent P_2O_5, all for domestic sale. Financial difficulties forced the company into liquidation in 1964, but there was no stoppage of production. Plans were being studied for increasing output with new processing techniques.

Sociedad Chilena de Fertilizantes Ltda., the only collector of guano in Chile, operated in the shore zones of Antofagasta and Tarapacá Provinces that are seasonal hosts to vast numbers of pelicans and other sea birds. Two types of guano are harvested: The fresh or white, extremely rich in anhydrous phosphate, nitrogen, and potassium, and the fossil or red, of lower grade consisting of rock that has been permeated by overyling guano deposits. Chilean 1964 production went to the two plants of the company at Mejillones in Antofagasta Province and Iquique in Tarapacá Province, where it was combined with 2,024 tons of guano imported from Peru and 17,348 tons of imported triple superphosphate potassium salts, and other material to produce 23,141 tons of reinforced white guano and 11,005 tons of guano superphosphate for domestic sales. Export of fertilizers containing guano remained prohibited by law.

Salt.—Production of salt in 1964 was reported as follows (data are preliminary):

Producer	Province	Department	Metric tons
Salina Punta de Lobos S.A.M	Tarapacá	Iquique	34, 650
Leandro Antonijevic y Cía. Ltda	do	do	24, 647
Fistonic, Kinast, y Cía	do	do	11, 100
Industria Salinera Müffeler y Cía. Ltda	do	do	7, 743
Empresa Minera Hernán Ramírez	Antofagasta	Antofagasta	10, 691
Sociedad Minera Navidad	do	do	20, 421
Sociedad Esteban Tomic D	do	El Loa	
Tiburcio Padilla	Atacama	Copiapó	
Total			109, 252

Cía. Sal-Chile, a newly formed company, bought a controlling equity in Cía. Salina Punta de Lobos S.A.M. and planned a major expansion of production from the Salar Grande deposits, near Iquique, for export mainly to other Latin American countries and Japan.

Sodium Sulfate.—Production of sodium sulfate in 1964 was comprised of 23,331 tons of unknown grade by Cía. Minera Canchones Ltda. near Iquique, 8,651 tons of 80 percent Na_2SO_4 by Sr. Hector Rojas A., in the Department of Antofagasta, and 2,547 tons of 81 percent Na_2SO_4 by Sociedad Minera Godoy, Schwenger y Cía. from its mine near Copiapó. A pilot plant started by Cía. Salitrera Anglo Lautaro to recover byproducts from its nitrate operations is planned to develop commercial production of 50,000 tons of sodium sulfate annually in the near future for marketing to the domestic paper industry.

Sulfur.—Native sulfur was recovered from caliche on the flanks of high volcanos in the Department of Arica, Tarapacá Province, and the Department of El Loa, Antofagasta Province. Sulfur is also recovered in the form of sulfuric acid from the fumes of copper smelters. Output in 1964 by source and producer was as follows:

Source and producer:	*Metric tons*
Native sulfur:	
Sociedad Azufrera Aucanquilcha	33,283
Sociedad Azufrera Borlando y Cía	8,492
Sociedad Azufrera, Agricola y Comercial Tacora S.A	1,050
Cía. Minera Volcanes	930
Sr. Abdo Tala Larenas Sr. Malas Blaselic	123
Total	43,878
Recovered from smelter fumes (sulfur content of acid):	
Braden Copper Co., Caletones smelter	9,242
Chile Exploration Co., Chuquicamata smelter	6,433
Total	15,675
Grand total	59,553

Sociedad Azufrera Aucanquilcha mined caliche containing about 58 percent sulfur by open-cut methods at a rate of approximately 7,000 tons per month. The caliche was processed in nine autoclaves. Roughly half the production in recent years has been sold to the copper company Empresa Nacional de Montos Blancos S.A., that in 1964 purchased a 28-percent equity in Sociedad Azufrera Aucanquilcha and reportedly planned to assist in increasing its sulfur output to 45,000 tons annually.

Sociedad Azufrera Borlando y Cía. used a battery of recently imported Japanese autoclaves to increase its production of refined sulfur to 5,760 tons, in addition to 2,118 tons of sulfur contained in caliche that was sold directly.

Production of refined sulfur by Sociedad Azufrera, Agricola y Comercial Tacora S.A. ended in June 1944 when mining operations were stopped for technical reasons.

Total production of the country, including recoveries from smelter fumes, was insufficient to meet domestic needs; sulfur imports during the year amounted to 5,887 tons, while exports, limited to Peru, were only 250 tons.

Talc.—The mines of Sr. Eduardo Martin Abejón in the Constitucion Department of Maule Province produced 1,150 tons of talc in 1964, about half of total Chilean output. The remainder was comprised of 910 tons from the mines of Industria Minera Vassali in the Quillota Department of Valparaiso Province, and 300 tons from the operations of Sr. Otto Bauer Wolf in the Corral Department of Valdivia Province. To satisfy requirements of the Chilean ceramics industry for talc, domestic production normally has been supplemented with minor tonnages of imported mineral.

MINERAL FUELS

Coal and Coke.—The 1963 merger of Cía. Carbonífera y Industrial de Lota and Cía. Carbonífera y de Fundición Schwager S.A., the two largest coal producers in Chile, was made official by a decree published

March 23, 1964. During the year the new combine contributed 75 percent of the total Chilean output of coal and lignite by processing bituminous coal taken from the mines on the Gulf of Arauco, west and south of Coronel in the Province of Concepción.

TABLE 7.—Chile: Production of bituminous coal and lignite in 1964

Producer and product	Department	Province	Production (metric tons)	
			Mine-run	Marketable
Bituminous coal:				
Lota-Schwager	Coronel	Concepción	1,354,463	1,257,351
Cía. Minera de Plegarias Ltda	Arauco	Arauco	345,543	334,316
Cía. Carbonera de Calico Sur Ltda	do			
Cía. Carbonera de Pilpico	do			
Cía. Carbonera de Victoria de Lebu	Lebu			
Total			1,700,006	1,591,667
Lignite:				
Cía. Carbonífera Los Copihues de Pupunahue S.A.	Valdivia	Valdivia	33,267	32,764
Cía. Carbonífera San Pedro de Catamutún.	do			
S.A. Ganadera y Comercial Sara Braun (Pecket Harbour mine).	Magallanes	Magallanes	55,553	52,726
Isidoro Quesado E. (Caupolicán mine).	do			
Maximo Alvaraz C. (Loreto mine)	do			
Vicente Felix D. (Estela mine)	do			
Juvenal Sepúlveda (Soledad mine)	do			
Santiago Florio C. (Natales mine)	Ultima Esperanza			
Total			88,820	85,490
Grand total bituminous coal and lignite.			1,788,826	1,677,157

The decline in the Chilean coal industry (which produced 2.3 million ton gross in 1955) has been of concern to the Chilean Government, which has sponsored remedial measures. Empresa Nacional de Electricidad S.A. (ENDESA—the National Power Enterprise) was expected soon to approve the construction of a 100,000-kilowatt thermoelectric power plant near Coronel which will require approximately 200,000 tons of coal annually. The Government also announced projected thermoelectric power expansion based on coal fueling for the mining areas of Antofagasta Province, and negotiated a trade agreement with Argentina for the export of significant quantities of coal to that country.

Deliveries of coal in 1964 are considered to have been similar in pattern to those of 1963, which were as follows:

Consumer:	*Metric tons*
Railroads	322,600
Manufacturing	319,900
Electric power	173,400
Gas industry	169,000
Coal producers	106,000
Merchant marine	29,500
Chilean Navy	8,800
Exports	1,000
Total	1,130,200

Coal imports in 1964 consisted of 437,212 tons of coking coal for the Huachipato steel plant and 10 tons of anthracite. Exports were only 101 tons to Bolivia.

Approximately 656,000 tons of Lota-Schwager's coal, nearly half its production, was mixed with 437,212 tons of imported low-volatile bituminous coal from the United States and coked to produce 246,499 tons of metallurgical coke, primarily for the Huachipato steel plant of Cía. de Acero del Pacífico S.A. The coal and lignite delivered to the gas industry yielded 83 tons of byproduct gashouse coke.

Natural Gas and Liquefied Natural Gas.—Another mainland discovery of natural gas was made at Gringos Duros 93 kilometers northeast of Punta Arenas, and Chilean production continued its spectacular growth to reach 234,420 million cubic feet, a 22-percent increase over the 1963 level. Posesión, on the Magallanes mainland, was the largest gas-producing field, followed by the Calafate, Chañarcillo, and Cullen fields on Tierra del Fuego and the Daniel field on the mainland. The island of Tierra del Fuego produced 117,539 million cubic feet of gas, barely over half the country total. Untouched reserves in the Magallanes Basin are known to be very large, but their remote location remained a deterrent to large-scale development. During the year 72 percent of production, or 167,965 million cubic feet of gas, was reinjected for repressuring petroleum reservoirs and for storage. Enough was processed at the five gas plants (one at the Posesión field, one at the Cullen field, and three at the Manantiales field) to produce 1,221,000 barrels of natural gas liquids; of this total 571,114 barrels was delivered to the Quintero Terminal for use in central Chile, 493,938 barrels was exported to Argentina and 91,517 barrels to Brazil, and the small remainder presumably consumed locally or stored. Shipments to the Quintero Terminal were comprised of 491,359 barrels of propane and 79,755 barrels of butane. Consideration was given to the feasibility of shipping liquified methane by cryogenic tanker transport to northern Chile, and to a proposed gas pipeline to Argentina where it would be connected to the YPF pipeline system from Comodoro Rivadavia to Buenos Aires. Another proposal for the establishment of petrochemical plants to use natural gas as feedstock was being studied by the Fluor Corp. for Empresa Nacional de Petróleo (ENAP), the Government enterprise and exclusive producer.

Oil Shale.—Oil shale has been discovered [3] in the eastern Cordillera at Lonquimay, Province of Malleco, in Eocene sediments overlying Mesozoic metamorphic and porphyritic basement rocks in a tectonic basin. The section contains oil shale beds 15 meters and 45 meters thick, separated by 30 meters of fine grained sandstone and calcareous conglomerate and overlain by another 30 meters of interbedded sandstone, limestone, and oil shale. The shales have yielded up to 20 gallons of oil per ton by distillation. The entire section is 250 meters thick and has not been recognized elsewhere. These partly fossiliferous sediments, called the San Pedro beds, are believed to have been deposited in vast saline lakes. No plans for exploitation of the oil shale have been announced.

---

[3] Rassmuss, J. E. Chile Seeks New Fields in Southern Longitudinal Valley. World Oil, v. 158, No. 6, May 1964, pp. 103–114.

Petroleum.—Although production of crude petroleum reached a new high of 13,687,000 barrels in 1964, the 3.6-percent increase over the previous year was by far the lowest attained since the inception of the industry in 1946, and unless new fields are found it may well mark the beginning of a reversal of the growth trend. Production has been confined to the southern part of Magallanes Province, where the mainland side of the Strait of Magellan yielded 7,132,000 barrels or 52 percent of the total in 1964, and the older declining fields of the island of Tierra del Fuego supplied the lesser portion for the second year. Production by fields, in decreasing order of magnitude, was from Daniel (mainland), Cullen, Posesión (mainland), Calafate, Sombrero, Punta Delgado (mainland), and Victoria. Exploration teams from the only producing company, Empresa Nacional de Petróleo (ENAP), and from United Geophyhical and the Delta Exploration Co. performed reconnaissance and detailed investigations on Tierra del Fuego and across the Strait of Magellan on the Brunswick Peninsula. Farther north, United Geophysical and the Delta Exploration conducted seismic exploration in the central valley (a tectonic graben) in the provinces of Llanquihue, Osorno, Valdivia, Arauca, and Nuble. As of the end of the year, results had proved disappointing, but the work continued.

ENAP continued to operate a small topping plant at the Manantiales field on the island of Tierra del Fuego and a refinery at Concon in Valparaiso Province. Deliveries to the Quintero Terminal in 1964, for processing at the Concon refinery, included 13,577,000 barrels of domestic crude and 2,998,000 barrels of imported crude, mainly from Venezeula. Crude actually processed amounted to 16,883,333 barrels, of which 81.7 percent was domestic. In addition to the natural gas liquids from Magallanes, deliveries of refinery products to distributors (including 255,869 barrels of ship bunker fuel) totaled 16,122,204 barrels, compared with 14,841,223 barrels in 1963. With indications that Concon would be unable to handle all of the Chilean production by 1965, the new refinery at San Vicente Bay near Concepción, scheduled for completion in that year, has been designed to process 35,800 barrels of crude daily, using 75 percent domestic and 25 percent imported petroleum, and thus to provide coverage for domestic requirements up to 1970 by increasing total Chilean refining capacity to 92,000 barrels per day. The expected daily output of products by the new refinery is as follows:

Product:	*42-gallon barrels*
High test gasoline	1,478
Standard gasoline	13,649
Kerosine	3,327
Diesel oil	6,478
No. 5 fuel oil	2,868
No. 6 fuel oil	6,195
Propane	755
Butane	755

A multiproduct pipeline is to be constructed from the new refinery 400 kilometers to San Fernando, and thence 100 kilometers north to Maipu, the ENAP distribution center for Santiago, which is now connected by pipeline to the Concon refinery. The new pipeline is scheduled for completion in June 1966.

Governmental Decree No. 20 of August 11, 1964, simplified and consolidated numerous acts previously in effect covering the distribution, sales, and refining of petroleum based fuels and lubricants. The major distributing firm in Chile is Esso Standard Oil Co. (Chile) S.A.C.

Cía. de Industrias y Azucar (COIA), a wholly owned subsidiary of W. R. Grace and Company, announced that it would construct a petrochemical plant using refinery byproducts (presumably naphthalene) and Chilean raw materials to produce phthalic anhydrite and formaldehyde, and reduce the importation of those products. The plant was expected to be completed in early 1966.

The Mineral Industry of Colombia

By Frank E. Noe[1]

◆

COLOMBIA'S mineral industry remained relatively unimportant in the overall world picture of mineral and metal production in 1964, but it continued to gain in importance as a source of raw materials for the rapidly expanding domestic industrial sector. The Ministry of Mines and Petroleum reported the value of 1964 mineral production excluding petroleum to be Col$832 million,[2] a slight gain

TABLE 1.—Colombia: Reported value of mineral production

(Thousand pesos [1])

Commodity [2]	1963	1964
Metals:		
Gold	113, 580	127, 646
Iron ore	38, 225	39, 050
Lead concentrate	600	967
Mercury	5	5
Platinum	15, 962	10, 344
Silver	760	932
Zinc concentrate	NA	440
Total	169, 132	179, 384
Nonmetals:		
Barite	1, 155	1, 122
Cement	284, 692	308, 044
Clays:		
Kaolin	4, 500	4, 841
Industrial	3, 520	3, 584
Diatomite	220	231
Dolomite	350	221
Emeralds	4, 925	2, 414
Feldspar	1, 500	1, 393
Gypsum	11, 220	11, 825
Lime	9, 700	9, 980
Limestone	17, 500	21, 364
Magnesite	50	44
Marble	800	650
Quartz, quartzite, sand	2, 600	2, 700
Salt	43, 398	49, 716
Sulfur	6, 825	6, 370
Talc	98	110
Other	-------------	2, 283
Total	393, 053	426, 892
Mineral fuels:		
Coal	176, 000	167, 000
Coke	56, 000	58, 800
Total	232, 000	225, 800
Grand total	794, 185	832, 076

[1] Free rate of exchange in 1963 averaged Col$10 per US$1; in 1964 it was Col$10.54 per US$1.
[2] Excludes values of petroleum, petroleum products, natural gas, and chromite which were not available.
NA Not available.

---

[1] Latin America specialist, Division of International Activities.

[2] Throughout this chapter values are given in currencies as reported because of differing conversion rates. Free rate of exchange in 1964 averaged Col$10.54 (pesos) per US$1: in 1963 it was Col$10 per US$1.

over the Col$794 million produced in 1963. The value of crude oil, natural gas, and petroleum refinery production was not available but probably accounted for an additional Col$2,000 million. The mineral industries contributed an estimated 4.2 percent of the gross national product, 3.5 percent from petroleum activities and 0.7 percent from mining.

While 1964 was a year of record petroleum production, the uncertainty generated by the official taxation policy clouded what otherwise would have been an optimistic picture for petroleum in Colombia. Petroleum has the potential of playing an increasingly important role in the Colombian economy; in 1964 it was the nation's second-ranking export commodity, provided a major share of Government revenues, and made a substantial positive contribution to the country's international balance of payments position.

Colombia continued to be the only important source of gem emeralds, producing about 95 percent of the world total. Platinum was the sole critical or strategic mineral produced in 1964. Although exports were only 1 percent of the world supply of platinum, Colombia ranked fifth among producing countries. The only other commodity in which Colombia has been a significant world producer is gold, production of which ranked the country 1st in Latin America and 10th throughout the world in 1964. These commodities were less important domestically than minerals more directly related to industrial development and domestic requirements, such as iron ore, limestone, salt, gypsum, and clay.

GOVERNMENT POLICIES AND PROGRAMS

The Ministerio de Minas y Petróleos, established by Decree No. 827 of March 23, 1954, and reorganized and expanded in 1960, continued to emphasize the search for mineral deposits, economic studies for the exploitation of known mineral deposits, and extension of technical assistance to private companies, especially small miners. Although the Ministry lacked sufficient technicians and funds, collaboration with departmental governments and with private operators became increasingly effective.

The Colombian Government retained responsibility for granting concessions to private companies for petroleum exploration and exploitation. It continued to participate in the petroleum industry through the medium of Empresa Colombiana de Petróleos (ECOPETROL). This firm by itself and through its share in a joint venture with Colombia-Cities Service Petroleum Corp. accounted for about 25 percent of total national crude oil production. Additionally, ECOPETROL owned and operated the Barrancabermeja refinery, Colombia's largest, which accounted for approximately half of refinery production.

The complex dispute between the private petroleum industry and the Colombian Government, touched off in 1961 by issuance of Law 10 and Decree 1348 that in effect canceled investment incentives authorized under previous legislation, had not been resolved by yearend, 1964. Briefly stated, the dispute arose from the Government seeking to increase its share of the profits from private petroleum operations by reinterpretation of tax laws and regulations. For some companies this meant the assessment of taxes by the Government that were twice what the companies felt they should pay under concession contracts issued with specific reference to provisions of the old law (Decree 2140 of 1955). One study of the issue indicated that the current Government tax policy would signify an 89–11 split (favoring the Government) on 1963 income. In 1962 the private petroleum industry initiated legal processes to invalidate the applicability of Decree 1348's unfavorable provisions to concession contracts signed before the decree was issued. At yearend the cases were under study by the Council of State.

Government control over the private oil companies was further extended in 1964 by two decrees issued by the Ministerio de Minas y Petróleos. Decree 2657 apparently contradicted the oil law by abolishing preferential treatment hitherto granted the first applicant for a particular concession. It also established new procedures which the Government claims will expedite the granting of concessions. Decree 2658 abolished the freedom to build and operate refineries embodied in the petroleum code of 1961. New refinery construction would require prior Government approval by a newly created committee of refinery planning. The regulations also provided that petroleum producers-exporters may be obligated to sell their crude to domestic refineries. In April the Ministerio de Minas y Petróleos ordered the shutting in of 88 oil wells in pursuance of the gas conservation policies established in the petroleum code and Law 10 of 1961.

Foreign technical assistance programs were active during the year. The program of two West German geologists was oriented toward the study of coal resources, domestic market potential, and export potentials of those coals lying within reasonable transportation distance of the north coast.

Field operations commenced under the loan agreement executed on September 18, 1963, between the U.S. Agency for International Development and the Ministerio de Minas y Petróleos. This agreement provided for funds of up to US$2 million with repayment in 40 years at low interest; these funds were to be matched by $1.6 million equivalent in national currency by the Government of Colombia for a 4-year mineral resources survey known locally as the Inventario Minero Nacional. The project staff at the outset of operations included 22 geologists of the Servicio Geological Nacional a division of the Ministerio de Minas y Petróleos and a chief U.S. adviser geologist and 4 economic geologists of the U.S. Geological Survey. The survey was to embrace 72,000 square kilometers in 4 separate areas centered primarily over existing industrial centers: The Sierra Nevada de Santa Marta, parts of the Departments of Antioquia and Caldas, parts of the Departments of Santander Norte and Santander, and the Bogotá region. Systematic geologic mapping and investigation of all mineral and metal resources (excluding coal and petroleum) in the four areas was contemplated. A proposed contract with a private firm for the initial photogeological mapping of the areas met with difficulties that were not resolved before yearend; however, progress toward solution indicated its execution early in 1965.

PRODUCTION

Colombia produces only a few metallic minerals and fewer metals. In 1964 principal metal products were iron and steel, gold, silver, and platinum. Statistics covering the production of precious metals appear to be incomplete, particularly those for platinum. Platinum production was reported as only 11,000 ounces while the Banco de la Republica reported exports of 20,647 troy ounces and the United States reported imports of 23,345 ounces from Colombia.

The Acerías Paz del Rio, S.A., the only integrated iron and steel plant in the country, continued to dominate the iron and steel industry, although the Empresa Siderurgica, S.A., of Medellin produced more than 50,000 tons of finished products and steel ingot from secondary sources.

The production of nonmetallic mineral commodities and products continued to dominate the nonfuel mineral field; cement was by far the most valuable industrial mineral commodity. The salt industry reached a new high, reversing the downward trend of 1961–63. Available data showed that the production of emeralds declined somewhat in 1964.

It is believed that the production reported represents sales by the Banco de la Republica except for 1963 when an extremely large production of moralla was credited to the Chivor emerald mine.

TABLE 2.—Colombia: Production of metals and minerals

(Metric tons unless otherwise specified)

	1960	1961	1962	1963	1964 [p]
Metals:					
Antimony concentrate	60	----------	----------	30	------
Chromite	70	185	140	110	400
Gold .... thousand troy ounces	434	401	397	325	365
Iron and steel:					
Iron ore .... thousand tons	655	676	680	695	710
Pig iron .... do	[r] 176	[r] 169	[r] 145	[r] 203	[e] 220
Steel ingots and castings .... do	[r] 172	[r] 192	[r] 157	[r] 222	[e] 220
Lead concentrate	1,070	1,290	670	500	806
Mercury .... 76-pound flasks	149	191	----------	3	3
Platinum:					
Crude .... troy ounces	20,865	20,160	14,100	22,983	11,150
Refined .... do	----------	17,197	11,908	18,700	9,572
Silver .... do	134,331	127,942	131,599	106,279	130,353
Zinc:					
Concentrate	2,300	2,200	431	600	710
Slab	540	1,250	194	----------	----------
Nonmetals:					
Barite	7,300	10,226	8,000	10,500	10,200
Cement:					
Portland .... thousand tons	1,447	1,572	1,725	1,810	1,940
White .... do	19	20	21	25	32
Total .... do	1,466	1,592	1,746	1,835	1,972
Clays:					
Kaolin .... do	20	50	70	75	81
For cement .... do	NA	320	350	360	360
Other industrial use .... do	NA	90	105	110	112
Diatomite	400	300	150	2,200	231
Dolomite	2,000	2,000	2,680	5,100	3,217
Emeralds:					
Gem .... thousand carats	39	38	51	51	[e] 55
Moralla .... do	53	89	294	2,004	[e] 214
Feldspar .... thousand tons	15	15	16	13	12
Gypsum .... do	70	75	83	[r] 102	108
Lime .... do	80	82	85	97	100
Limestone .... do	2,700	2,950	3,200	3,400	4,273
Magnesite	NA	100	100	250	220
Marble .... cubic meters	149	200	650	800	650
Quartz, quartzite, industrial sand thousand tons	NA	118	125	[e] 130	135
Salt:					
Terrestrial .... do	235	267	266	263	289
Marine .... do	68	70	39	34	51
Total .... do	303	337	305	297	340
Sulfur	9,042	10,100	10,207	13,000	12,134
Talc	350	550	650	650	730
Mineral fuels:					
Coal:					
Anthracite	NA	NA	NA	NA	[1] 2,000
Bituminous .... thousand tons	2,600	2,800	3,000	3,200	3,000
Coke .... do	330	325	360	400	420
Natural gas, gross production million cubic feet	82,562	78,775	78,424	[r] 82,979	83,899
Natural gas liquids thousand 42-gallon barrels	[r] 1,274	[r] 1,266	[r] 1,334	[r] 1,392	NA
Petroleum:					
Crude .... thousand 42-gallon barrels	55,770	53,247	51,908	60,343	62,596
Refinery products:					
Aviation gasoline .... do	521	537	601	[r] 566	540
Motor gasoline .... do	[r] 9,161	[r] 10,885	[r] 10,779	[r] 10,858	11,312
Jet fuel .... do	44	121	174	[r] 153	195
Kerosine .... do	1,623	1,596	1,856	[r] 1,809	1,793
Distillate fuel oil .... do	[r] 3,423	3,767	[r] 4,069	[r] 4,075	4,138
Residual fuel oil .... do	9,567	8,892	10,478	[r] 9,193	8,742
Lubricants .... do	94	118	[r] 136	[r] 140	372
Liquefied petroleum gas .... do	[r] 172	279	322	[r] 356	1,017
Other .... do	[r] 1,944	[r] 2,057	[r] 2,050	[r] 2,318	3,049
Total .... do	[r] 26,549	[r] 28,252	[r] 30,465	[r] 29,468	31,158

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Exports.

TRADE

Petroleum, petroleum products, and cement were the principal mineral exports of Colombia in 1964. The export of crude oil was valued at US$75 million, a marked decrease from the US$79 million reported by the Ministerio de Minas y Petróleos for 1963. This was equivalent to about 14 percent of Colombia's total export value of US$536.6 million recorded for 1964. In addition, fuel oil exports were valued at US$7.3 million, while cement and platinum exports were valued at US$1.9 million and US$1.5 million, respectively.

Colombia continued to import a large percentage of its iron and steel requirements, mainly in the form of steel mill products. The importation of aluminum and copper ingots for processing by domestic industries increased in 1963, the latest year for which complete trade statistics are available.

The United States continued to be the principal trading partner in 1964, receiving 51.8 percent of Colombia's exports by value and supplying 48.3 percent of Colombia's imports by value.

TABLE 3.—Colombia: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Iron and steel:			
Semimanufactures	21	9	Panama 4; Ecuador 3.
Scrap	66	33	All to United States.
Platinum ... troy ounces	14,100	22,983	United States 22,566; Brazil 417.
Nonferrous metals, including scrap	4	21	Mainly to Belgium-Luxembourg.
Metallic waste and slags	27	20	All to West Germany.
Ores and minerals, not further specified	(1)	20	Mainly to United States.
Nonmetals:			
Cement	168,504	122,347	Puerto Rico 78,665; Costa Rico 32,986; Netherlands Antilles 3,096.
Clay and clay products:			
Kaolin	12	12	All to Venezuela.
Common brick	163	168	Do.
Refractory brick	(1)	168	Trinidad 161; Panama 7.
Diamond, industrial ... carats	----------	25,000	All to United States.
Mica, sheet and film, simply cut	----------	12	All to Honduras.
Mineral fuels:			
Coal, all types	247	238	Venezuela 234.
Coke	178	449	All to Venezuela.
Coal tar and mineral pitch	102,057	24,723	Argentina 14,971; United Kingdom 9,752.
Petroleum: Crude thousand 42-gallon barrels	24,311	31,171	Trinidad 11,860; United States 8,849; Netherlands 7,082.
Refinery products:			
Kerosine ... do	----------	17	All to Panama.
Distillate fuel oil ... do	16	123	Do.
Residual fuel oil ... do	3,878	2,257	United States 630; Peru 555; Panama 474.
Lubricants including greases thousand 42-gallon barrels	----------	32	Mainly to Panama.
Asphalt	----------	1,442	All to Ecuador.
Other	3,020	15,014	United Kingdom 12,611; Panama 2,418.

[1] Less than ½ unit.

Source: Anuario de Comercio Exterior, 1962 and 1963.

TABLE 4.—Colombia: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Bauxite	6,082	7,200	British Guiana 4,388; Surinam 2,705.
Alumina	276	101	United States 64; West Germany 32.
Ingots, castings, scrap	4,808	6,961	Mainly from United States.
Semimanufactures	737	696	United States 375; West Germany 131.
Antimony and alloys, unwrought	40	67	Taiwan 43; United States 16.
Copper:			
Sulfate	3	51	Mainly from France.
Metal:			
Unwrought:			
Unalloyed	164	312	Chile 108; Belgium-Luxembourg 100.
Alloyed	20	130	Mexico 52; United States 27; United Kingdom 26.
Semimanufactures:			
Unalloyed	2,940	3,832	United States 1,552; Canada 450; Finland 425.
Alloyed	1,285	737	Canada 288; West Germany 103; United States 96.
Iron and Steel:			
Iron ore	133	----------	
Pig iron and scrap	379	5,332	Mainly from Panama.
Ferroalloys	1,884	3,693	Republic of South Africa 2,265; Canada 503; Switzerland 492.
Ingots, blooms, billets	4,945	1,152	Mainly from Venezuela.
Semimanufactures	165,117	169,314	United States 50,600; Japan 37,480; West Germany 30,396.
Lead:			
Ore	----------	254	All from Peru.
Ingots and plates	233	1,397	United States 924; West Germany 117.
Semimanufactures	10	44	Mainly from United States.
Litharge	342	444	Mexico 331; United States 105.
Magnesium and alloys, unwrought	7	1	All from West Germany.
Mercury ......76-pound flasks	89	172	Italy 115; United States 24.
Nickel:			
Ingots and anodes	34	49	United States 38; Canada 6.
Castings and forgings	45	238	United Kingdom 143; West Germany 55.
Semimanufactures	65	109	West Germany 63; United States 30.
Platinum, unwrought ......troy ounces	950	64	All from United States.
Silver:			
Ingots, bars, powder ......do	25,238	50,477	United States 26,942; Mexico 23,502.
Semimanufactures ......do	14,275	3,665	United States 2,540; West Germany 1,125.
Tin:			
Ingots, including alloys ..long tons	126	266	West Germany 81; United Kingdom 50; Malaya 46.
Semimanufactures ......do	66	42	United States 16; West Germany 9.
Zinc:			
Ore	----------	194	All from Peru.
Slabs, plates, pellets	1,243	4,815	United States 1,494; Canada 817, Mexico 801.
Castings and forgings	46	1	All from India.
Scrap	----------	12	All from United Kingdom.
Semimanufactures	487	149	Belgium-Luxembourg 44; West Germany 43; United States 41.
Other ores and minerals	3,231	979	United Kingdom 931; United States 30.
Other metals and alloys	10	9	Mainly from United States.
Nonmetals:			
Abrasives	169	250	United States 100; West Germany 94.
Asbestos, crude	11,084	12,933	Canada 10,002; United States 2,780.
Barite and witherite	10	17	United States 10; West Germany 6.
Borax, refined	626	977	United States 973.
Cement	4,037	566	West Germany 285; Venezuela 213.
Clay and clay products:			
Bentonite	2,375	2,641	United States 2,640.
Kaolin	3,127	3,422	United States 3,355.
Refractory, calcined	872	756	United States 689.
Other, calcined, washed or ground	18	155	United States 148.
Refractory brick, all types	2,405	2,960	United States 1,860; Austria 631; West Germany 358.
Cryolite	9	4	Denmark 3; West Germany 1.
Dolomite	2,647	4,800	All from Belgium-Luxembourg.
Feldspar and fluorspar	302	518	United States 221; Republic of South Africa 173.
Fertilizers:			
Nitrogenous	22,147	20,154	West Germany 12,544; Italy 1,993; Netherlands 1,725.
Phosphatic	32,306	54,009	United States 49,971; Netherlands 2,354.
Potassic	17,742	35,284	United States 12,151; West Germany 9,162; East Germany 8,938.
Mixed	126,197	33,747	West Germany 15,723; Netherlands 11,847; United States 3,168.

TABLE 4.—Colombia: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals—Continued			
Graphite	40	45	United States 31; United Kingdom 8.
Gypsum:			
Crude	3,523	1	All from United Kingdom.
Calcined	596	470	United States 435.
Infusorial earth	1,440	870	Mainly from United States.
Lime	22	2	All from United States.
Magnesite	19	37	Austria 19; United States 11.
Mica, crude	193	136	Mainly from United States.
Mineral pigments	45	30	Mainly from Spain.
Quartz:			
Ground	455	93	All from United States.
Grinding balls	464	236	Belgium-Luxembourg 121; France 114.
Salt	3	7	United States 4; West Germany 3.
Sand	319	668	All from United States.
Slate	151	129	Spain 70; Portugal 59.
Sodium carbonate	6,087	7,817	United States 5,169; United Kingdom 2,591.
Sodium hydroxide	25,373	22,572	All from United States.
Stone, building and monumental	405	7	All from France.
Sulfur:			
Crude	4,373	1,011	All from United States.
Refined	476	2,389	Do.
Talc and steatite	1,128	1,006	United States 606; Italy 375.
Mineral fuels:			
Coal, anthracite	----------	15	All from West Germany.
Coke	23	11	All from United States.
Other fossil hydrocarbons, solid:			
Gilsonite	7	9	Do.
Ozocerite and montan wax	43	115	United States 101; West Germany 14.
Mineral tars and products	44	129	Mainly from West Germany.
Petroleum refinery products:			
Gasoline:			
Aviation..thousand 42-gal. bbls..	117	281	Mainly from Netherlands Antilles.
Motor....do....	1,462	----------	
Kerosine and jet fuels....do....	1,458	25	Netherlands Antilles 14; United States 8.
Distillate fuel oil....do....	11	11	United States 6; Netherlands Antilles 4.
Residual fuel oil....do....	6	----------	
Lubricants including greases..do....	248	198	United States 174; Netherlands Antilles 19.
Vaseline and paraffin	24,116	25,885	United States 13,225; East Germany 9,318.
Asphalt	129	329	West Germany 202; United States 74.
Other	866	801	United States 457; Netherlands Antilles 310.

Source: Anuario de Comercio Exterior, 1962 and 1963.

COMMODITY REVIEW

METALS

Gold.—Gold production increased 12.3 percent in 1964, marking the reversal of a downward trend begun in 1961. The International Mining Corp. through subsidiaries and affiliated companies was the principal gold producer. In October 1963, the South American Gold and Platinum Co. had merged with International Mining Corp. and adopted the name of the latter company. From properties operated by the former South American Gold and Platinum Co., 133,800 ounces of gold was produced in 1964. Of this amount 87,000 ounces came from the underground operations of the Companía Frontino Gold Mines, Ltd., and 46,800 ounces came from dredging operations. Additionally, Pato Consolidated Gold Dredging, Ltd., an affiliate of the corporation and the largest gold dredging operation in Colombia, produced gold-silver bullion equivalent to 95,000 ounces of gold. Gold recovery from dredges of South American Gold and Platinum Co. declined during the year compared with 1963 recovery because one of the five dredges was inoperative for 5 months during its transfer to a new dredging site and a second unit was shut down in August after economic reserves had been exhausted. At yearend, three dredges were operating in the Department of Chocó and one in Nariño. Pato Consolidated operated a fleet of six dredges until August when a seventh dredge began its shakedown run. The seven dredges all operated in and near the Nechi River within an overall radius of 12 miles and were all serviced from the main camp at El Bagre.

Through the efforts of the Colombian Mining Association a bonus of Col$15 per ounce of gold sold to the Banco de la Republica was approved by Decree 1734 during August. This bonus, payable only to the large producers, effectively put an end to private sales, and since that time all sales have been made directly to the Banco de la Republica on the basis of US$35 per ounce, payable 25 percent in dollars and 75 percent in pesos at the free exchange rate during the week prior to the sale, plus the bonus. Small producers (those producing less than 30 ounces per month) have been receiving a bonus of Col$27.06 per troy ounce since 1959. Gold sold by the large producers in 1964 averaged US$36.28 an ounce, compared with US$35.14 in 1963.

Iron and Steel.—A generally growing economy and expectation of greatly increased major manufacturing activity in such areas as automobiles and machinery led to the implementation of both horizontal and vertical expansion plans in the steel industry. Market projections showed that even with all new capacity contemplated, there would probably be a net gap between local output and consumption of some 300,000 tons of finished products by the end of 1970.

Acerías Paz del Rio, S.A., continued to be the dominant steel producer in Colombia, producing 181,000 tons of products in 1964, 22,000 tons above the 1963 level and about 80 percent of total finished steel production. The capacity of the company's rolling mills exceeds the capacity of the blast furnace, necessitating imports of primary forms of steel to permit uninterrupted mill operations. Producers other than Paz del Rio use scrap and also fabricate or finish imported and domestic billets; therefore, actual Colombian steel consumption is difficult to estimate. A dependence on imports of steel products continued during the year despite the rising level of domestic production. In 1963 imports of semifinished steel and steel products exceeded 175,000 metric tons, while total output from Paz del Rio and minor mills was estimated at 210,000 tons.

The second largest manufacturer of iron and steel products was the Empresa Siderurgica, S.A., of Medellin. In 1963 it produced a total of 49,685 tons of products, both finished and steel ingot. Ingot production from locally available scrap was 22,000 tons. The firm fabricates iron reinforcing rods, galvanized water pipe and accessories, electric conduits, castings for machinery, railroad wheels, and light products from its own ingots or those purchased from Paz del Rio.

Plans announced in 1963 for a new natural-gas-fired sheet-rolling mill at Barranquilla (Atlantico) seemed destined for indefinite postponement or complete abandonment at yearend 1964. Initial production was to consist of 76,000 tons of finished steel per year, mostly plate and tinplate. This project, proposed by Siderurgica del Caribe, a company established by a group of Colombian industrialists, gained the active interest of the Export-Import Bank and of several prominent U.S. equipment producers. However, mobilization of external resources to finance the undertaking depended on raising local capital of Col$100 million. The Colombian organizers at one time claimed to have the local capital available, but it apparently was at least in part withdrawn.

During 1964 Acerías Paz del Rio signed contracts for the purchase of equipment and execution of work valued at US$18,296,884 and additional contracts for more than Col$15 million. Financing was covered by a loan agreement signed in June 1963 with the International Bank for Reconstruction and Development (IBRD) for US$30 million to cover a first phase in the company's major expansion program. The first step of the program includes acquisition of equipment to increase plant efficiency, to raise output to 220,000 tons per year (including flat products), and for diversification of products. Consulting engineers for the expansion project are John Miles and Partners (London).

The principal contracts awarded in 1964 follow: (1) Davy and United Engineering Co., Ltd., a British company, has a contract worth over £3 million (US$8.4 million) to supply a complete steel rolling mill, including a 42- by 108-inch blooming and slabbing mill, a 900-ton hydraulic slab shear, and a 56-inch reversing hot-strip finishing mill; (2) the German firm, Lurgi Gesellschaft für Chemie und Heutenwesen m.b.H. is to supply a crushing plant for iron, limestone, and coke, a mixing plant to supply raw materials used in sintering and for charging the blast furnace, and a plant to produce 1,200 tons of sinter per day; (3) the firm Brown Boveri is to supply an axial type of turbo blower with a capacity of 1,715 cubic meters per minute, to be driven by a steam turbine; (4) Salem Brosius (England), Ltd., will supply six soaking pits, each of 80-ton-per-hour capacity and equipped with all of the necessary auxiliary equipment; (5) Gesellschaft für Linde's Eismaschinen Aktiengessellschaft was awarded the contract for an oxygen plant to produce 25 tons per day of gaseous oxygen with a purity of 99.5 percent; (6) Klöckner Industrie Anlagen G.m.b.H. will supply annealing furnaces and a wire galvanizing line to increase the present annealing capacity by 2,500 tons per year and galvanizing capacity by 20,000.

In the second stage of the Paz del Rio expansion program, a major change in the entire character of the firm's operation is contemplated. Stress will be placed on output of flat products rather than basic items such as ingots, rails, rods, and angles. A cold-rolling mill will be added to achieve this end, and this phase of the plan should be completed by 1969. Equipment and service costs of this section of the program will be approximately US$9 million in foreign exchange. The third stage in the program, costing some US$55 million, may be completed in the mid-1970's to bring total output to about 400,000 tons of which half would be flat products.

During 1964 a project for the installation of a new steelworks with an annual capacity of 300,000 tons at Tibitó was announced in the Revista Latinoamericana de Siderurgia. The plant, in which Rheinische-Stahlwerke, A. G., is participating, will comprise a blast furnace, a melting shop, a rolling mill, and a wire drawing plant. The Revista also reported that the Companía Minera Eguza, S.A., was studying the possibility of establishing a plant for the production of ferroalloys in the Department of Antioquia. Colombian consumption of ferromanganese is estimated at 3,000 tons per year.

The International Finance Corp. and the Atlantic Community Development Group for Latin America (ADELA) have agreed to invest, respectively, Col$10 million and Col$5 million in shares of Forjas de Colombia, a company formed to build and operate a plant for the production of steel forgings in Bucaramanga (Santander) with an annual production capacity of 7,800 tons of high-quality die-forged steel products.

Lead.—Lead concentrate has been produced as a byproduct of gold mining operations at the Frontino mine of the International Mining Corp. The increase of 61 percent in the output of concentrate in 1964 represented the return toward normal of production adversely affected by a lengthy strike during 1963.

Platinum.—Output of platinum by the Companía Minera Chocó Pacifico, a subsidiary of the International Mining Corp., was approximately 9,400 fine troy ounces, a decrease of approximately 27 percent from 1963 production. The decline in platinum recovery reflected the lower content of metal remaining in Colombian reserves.

Silver.—The Frontino mine of the International Mining Corp., the largest producer of silver, produced 111,613 troy ounces in 1964, 85 percent of total Colombian production.

NONMETALS

Cement.—According to figures of the Banco de la Republica, exports of cement increased 41 percent during 1964 to a total of 170,000 tons. In July an 80-percent expansion of the capacity of Cementos del Caribe's Barranquilla plant was put into full operation. With this expansion, the Barranquilla plant, the largest in Colombia, will account for about 30 percent of Colombian cement production. Cementos del Caribe hoped to export all or most of the 80-percent increment in production, about 250,000 tons annually. This, however, may not be possible since other projects for expansion of cement production were lagging behind schedule and domestic cement consumption was increasing about 100,000 tons per year.

Completion of the Toluviejo cement plant, financed by the Corporación Financiera Colombiana de Desarrollo Industrial, previously scheduled for 1966, was rescheduled for late 1967. Initial planned production is to be about 240,000 tons annually. The planners of the Toluviejo plant believe that it will be the most efficient in Colombia. The plant will employ the dry process of production, using rotary kilns fired by natural gas. A gas-suspension preheating system will be installed in the kilns to conserve fuel. A German firm will supply almost all of the machinery and equipment for this plant and will also provide 15 percent of the initial capital.

Emeralds.—Decree 293 of February 14, 1964, regulates the cutting, transfer, sale, and exportation of emeralds mined within Colombia. This new regulation was a further attempt by the Government to regulate the emerald industry for the benefit of the country as a whole, in part by reducing or eliminating the contraband traffic in gems.

Fertilizers.—Amoniaco del Caribe (AMOCAR), owned by International Petroleum (Colombia) Ltd. (INTERCOL), began the first

Colombian production of ammonia in 1963, and through yearend 1964 was Colombia's only large-scale producer. The plant continued to utilize propane and butane gases from the adajacent INTERCOL refinery, but recent completion of a natural gas pipeline to Mamonal led to plans to switch to natural gas. About half of AMOCAR's ammonia production goes to Abonos Colombianos (ABOCOL), also in Mamonal, for complete fertilizer production.

ABOCOL (owned 52 percent by Standard Oil Co. of New Jersey and 48 percent by Colombian investors) is the largest producer in Colombia's sizable fertilizer industry. In 1964, ABOCOL produced eight formulas of complete fertilizers and sizable amounts of urea. ABOCOL, like the other mixed fertilizer producers in Colombia, imported phosphate rock, potash, and phosphoric acid, primarily from the United States, while securing nitrogen nutrients and other materials locally.

The other large-scale producer of complete fertilizer was the firm Compania de Productos Quimicos Nacionales S.A. (SULFACIDOS), with a 16,500-ton-annual-capacity plant in Medellin and a 154,000-ton-annual capacity plant in Barrancabermeja. SULFACIDOS' actual production in 1964 was only about 66,500 tons, partly owing to difficulties in obtaining nitrogen nutrients. SULFACIDOS also produced 19,500 tons of 20-percent-concentration superphosphate in 1964 at its Medellin plant. The firm was planning a second plant for Barrancabermeja to produce 88,000 tons per year of double superphosphate. SULFACIDOS, hindered by inadequate supplies of sulfur, was trying to develop a new sulfur deposit at yearend to meet its requirements for the production of sulfuric acid, which the firm makes for its own consumption.

Industria Colombiana de Fertilizantes (ICF), owned 65 percent by Colombian Government agencies, produced some ammonia and nitric acid but only as intermediates for ammonium nitrate and complete fertilizer production. This Government-sponsored fertilizer plant in Barrancabermeja has been widely considered a white elephant and a waste of resources. The ammonia plant began production in 1963 with a designed capacity for 17,600 tons of ammonia per year. Numerous technical failures in materials and market problems have prevented ammonia production from reaching more than 22 percent of rated capacity. Similarly, nitric acid production has been less than 10 percent of capacity. In 1964, ICF produced just over 10,000 tons of complete fertilizer, which accounted for over 50 percent of its sales.

At yearend 1964, the entire Colombian fertilizer industry was operating considerably below its installed capacity, but it was expected that consumption of fertilizer products would increase rapidly as effects of their application become known to the vast number of farmers who have not yet used commercial nutrients.

Salt.—Production of salt in 1964 reached a new high. The major part of the increased production came from the terrestrial salt deposits. The production of marine salt has been reduced since 1961 to permit the enlargement of the salt beds at Manaure, which will be the prime source of raw material for a new alkali plant at Mamonal, under construction by Planta Colombiana de Soda. Target production of 300,000 tons annually will include 100,000 tons for export and 50,000 tons for domestic human consumption. The plant was scheduled to be inaugurated in May 1966.

MINERAL FUELS

Coal.—Colombiana Carbones de Carare, a Colombian coal mining company, began in the fall of 1964 the export of Colombian coal by shipping 2,000 tons of anthracite to Belgium; it was expected that further shipments amounting to about 15,000 tons would be made to European countries within the immediate future. It was anticipated that the entire output of anthracite deposits at Landazuri, Department of Santander, would be exported and earn foreign exchange amounting to US$2 million per year. The Colombian press reported that France had expressed interest in importing 100,000 tons of bituminous coal from Colombia. In the past, Japan also had indicated some interest in Colombian coal.

The largest individual producer, Acerías Paz del Rio, operated captive mines near its plant at Belencito. Until recently the development of the major Colombian coalfields (Valle de Cauca, El Cerrejon, and La Jagua deposits) was on a local basis to provide the requirements of the adjacent market only. In recent years the program of mine development and modernization changed the pattern of trade to make available sufficient production to include foreign markets as well.

Natural Gas.—Gross production of natural gas increased 1.1 percent over 1963 production despite the shutting in of 88 wells ordered by the Government. The Minister of Mines and Petroleum explained that this step would save the country 42.3 million cubic feet of gas per day

TABLE 5.—Colombia: Natural gas production and consumption

(Million cubic feet)

Concessionaire	Well production	To gas plants	Transformed	Injected	Gas lift	Used by industry	Used as fuel	Flared
Empresa Colombiana de Petróleos (ECOPETROL):								
1961	17,657	13,687	3,303	4,576	--------	--------	5,981	3,797
1962	16,915	13,554	3,530	4,351	192	--------	5,481	3,522
1963	26,683	13,951	435	5,490	195	--------	5,575	12,732
Colombian Petroleum Co. (COLPET):								
1961	36,650	13,979	507	325	2,109	--------	2,464	33,354
1962	37,572	17,553	511	2	1,972	3,677	2,049	29,160
1963	29,376	18,319	683	--------	1,648	5,899	1,860	17,602
Shell-Condor, S.A.:								
1961 [1]	19,367	--------	--------	--------	--------	--------	765	18,603
1962	9,661	--------	--------	--------	1,504	609	850	8,228
1963	6,779	--------	--------	--------	885	1,306	814	4,659
Texas Petroleum Co. (TEXPET):								
1961	5,076	--------	--------	--------	--------		1,820	3,386
1962	4,754	--------	--------	--------	1,407	--------	551	2,796
1963	4,271	--------	--------	--------	1,753	--------	505	2,013
Antex Oil & Gas Co.:								
1962	8,488	--------	--------	--------	--------	--------	37	8,451
1963	7,764	--------	--------	--------	--------	--------	38	7,726
International Petroleum (Colombia) Ltd. (INTERCOL):								
1961	24	--------	--------	--------	--------	--------	--------	24
1962 [2]	1,034	--------	--------	--------	--------	--------	29	1,005
1963	41	--------	--------	--------	--------	--------	--------	41
INTERCOL-Sinclair-BP:								
1963	8,064	--------	--------	--------	--------	--------	128	7,936
Total: [3]								
1961	78,775	27,666	3,810	4,901	2,109	(2)	11,031	59,164
1962	78,424	31,107	4,041	4,352	5,075	4,286	8,995	53,162
1963	82,979	32,270	1,118	5,490	4,481	7,205	8,921	52,710

[1] Includes 8,392 million cubic feet from Dificil concession transferred to Antex Oil & Gas Co. in 1962.

[2] Includes 999 million cubic feet from Provincia field operated in partnership with Sinclair and BP. Production reported separately in 1963.

[3] Detail may not add to totals shown because of rounding.

with a wellhead value of US$2,115 and a potential commercial market value of approximately US$11,148. The gas-oil ratio established to determine the wells to be closed was 2,000 cubic feet per barrel of crude or over. Permission may be granted to operate certain wells in this category provided the gas is entirely utilized.

In December Sinclair Colombian Oil Co., Inc., and BP Exploration Co., Ltd. (Colombia), inaugurated a US$2.5 million gas reinjection plant at its Provincia petroleum production field to reinject into the formation 25 million cubic feet of natural gas daily that is produced with the crude oil and that had previously been flared. Colombia-Cities Service Petroleum Corp. also has installed a compressor plant for injecting 35 million cubic feet of gas daily at its Payoa field. Installation of these new gas plants raised the production of liquefied petroleum gas (LPG). Demand for LPG in Colombia was about 2,300 barrels per day in 1963. About one half of it was consumed in Bogotá.

TABLE 6.—Colombia: Production and distribution of natural gas liquids

(Thousand gallons unless otherwise specified)

	ECOPETROL			COLPET		
	1961	1962	1963	1961	1962	1963
Gas treated million cubic feet	13,687	13,554	13,951	13,979	17,553	18,319
Products:						
Propane	8,645	8,369	7,767	6,863	9,638	12,608
Natural gasoline	17,020	15,409	15,628	10,683	11,452	11,692
Butane	9,969	10,112	8,275	---	1,044	2,490
Distribution:						
Propane:						
Sold to domestic market	[1] 16,702	[1] 17,507	[1] 18,823	[2] 6,949	[2] 12,865	[2] 15,447
Consumed by company	---	---	151	3,179	292	255
To stocks	146	158	---	−39	757	650
Natural gasoline:						
To refineries	15,651	13,957	15,160	---	---	---
Mixed with crude and exported	---	---	---	10,153	11,324	10,780
Sold to domestic market	1,390	1,425	442	---	---	---
Stocks	−21	27	26	530	128	912
Butane:						
To refineries	9,957	10,112	8,303	---	---	---
To stocks	8	---	−28	---	1,044	2,490

[1] Includes propane from Barrancabermeja refinery.

[2] Includes propane from Cartagena refinery.

The first natural gasline from Cicuco field in Barranquilla, a distance of 225 kilometers, was inaugurated in 1962 and has since been doubled in capacity to nearly 50 million cubic feet daily. It has supplied power to approximately 80 percent of the industry in Barranquilla. A 160-kilometer line from the Antex Dificil field in the lower Magdalena River Valley was being constructed to Barranquilla to supply a new petrochemical plant. The 195-kilometer-long gasline from the Jobo-Tablones field of John W. Mecom to Cartagena, to feed new chemical plants there, was nearing completion. Gas from the COLPET Barco concession was employed directly at the electrical plant at Cucuta.

Petroleum.—At the beginning of 1964, proved reserves were estimated at 1,700 million barrels. Crude petroleum production in 1964 was the highest in Colombia's history, approximately 3.7 percent above the previous annual record set in 1963. The petroleum export picture, however, was less encouraging. Cumulative data for the first 11 months of 1964 showed crude exports were down to 27.3 million barrels from 29.1 million barrels for the same period in 1963, or about US$4.9 million less in export earnings. The decrease in exports despite increasing production was due, in part at least, to the fact that domestic consumption has been expanding faster than production. At the inauguration of the Rio Zulia pipeline in August 1964, the president of Richmond Petroleum Co. of Colombia pointed out that between 1950 and 1963 consumption had risen from 20,000 to 70,000 barrels per day and that the 1964 annual rate of increase was about 10 percent. At this rate consumption would equal the 1964 production level in 8 years. He further stated that unless more discoveries on the scale of the past 4 years are made, Colombia may become a net oil importer during the 1970's.

TABLE 7.—Colombia: Crude oil production and exports by companies

(Thousand 42-gallon barrels)

Company	1961		1962		1963	
	Production	Exports	Production	Exports	Production	Exports
ECOPETROL	10,200	----------	10,505	----------	9,473	657
COLCITO (Cities Service)	----------	----------	2,170	645	8,697	3,960
COLPET (Mobil and Texas)	16,557	12,455	14,160	11,429	13,223	10,426
Shell-Condor	13,437	13,199	11,690	10,338	9,880	8,171
Antex	----------	----------	221	74	185	----------
Texas	12,903	1,876	11,710	1,825	10,680	6,028
INTERCOL (Jersey Standard)	73	----------	1,388	----------	101	----------
Sinclair-BP-INTERCOL	----------	----------	----------	----------	8,045	2,619
Neuva Granada (United Fruit)	77	----------	64	----------	59	----------
Total	53,247	27,530	51,908	24,311	60,343	31,861

Source: Memorias del Ministro de Minas y Petróleos.

Crude production was handicapped by serious and long-lasting labor troubles. A strike at Shell's 27,000-barrel-per-day Casabe field was finally settled on October 16 by a wage increase of 21 to 23 percent plus new fringe benefits. Sympathy strikes during September at the fields of other oil companies also added to the general decrease in production. A fortunate and offsetting development was the entrance into production of Richmond Petroleum's new 25,000-barrel-per-day Rio Zulia field and 493-kilometer pipeline to Santa Marta.

On June 25 Tennessee Colombia, S.A. (TENNECOL), a wholly owned subsidiary of a U.S. firm, Tennessee Overseas Co., signed a significant new exploration and exploitation contract with the Colombian Government's oil enterprise, Empresa Colombiana de Petróleos (ECOPETROL). The contract covers 116,407 hectares of land in border zones of the De Mares concession, over which ECOPETROL has all rights. The land is in the municipalities of Bolivar and Vélez in the Department of Santander, and Puerto Berrio, Department of Antioquia. Provisions of the agreement call for 100 percent of the exploration cost to be paid by TENNECOL, whether or not a discovery is made, and for exploitation costs to be evenly divided between the two companies. TENNECOL is to supply 19 percent of gross production as a royalty to ECOPETROL plus 50 percent of the remainder. The contract began on the day of signing and has a maximum duration of 31 years, 6 years maximum for exploration and 25 years for exploitation. The latter begins from the date of the first discovery.

TENNECOL also holds the concession for the Dina field in southernmost Magdalena Valley near Neiva. INTERCOL shares equally in the new Dina field, which is prepared for commercial production but is awaiting construction of a projected 330-kilometer pipeline to the projected refinery at Bogotá.

The most impressive discovery in recent years was that of the Texas Petroleum Co. associated with the Colombian Gulf Oil Co. at the Orito field in the Department of Putumayo near the Ecuadorean border. Although commercial prospects for the field were not considered established at yearend 1964, eight good producing wells had been completed. Wildcatting also has been started to validate other concession blocks in the joint holding.

TABLE 8.—Colombia: Salient statistics of the petroleum industry

	1961	1962	1963
Crude oil:			
Production thousand 42-gallon barrels	53,247	51,908	60,343
Delivered to refineries do	25,574	27,500	28,035
Exported do	27,530	24,311	31,861
Export value thousand U.S. dollars	68,239	60,585	79,049
Refinery products:			
Refinery output thousand 42-gallon barrels	28,252	30,465	29,468
Consumption do	21,652	23,125	22,931
Exports do	2,590	4,288	2,769
Export value thousand U.S. dollars	5,155	8,237	5,111
Employment:			
Concessions number of persons	9,590	9,535	11,661
Pipelines do	1,160	1,130	1,104
Wages and salaries thousand Colombian pesos	198,570	226,323	319,652

ECOPETROL's production has stayed at the 10-million-barrel level for several years, but the Government announced plans for a major expansion of ECOPETROL's role in the petroleum industry. A 5-year expansion program to be completed in 1969 will require an investment of about US$140 million. The program, already underway, was aimed at making ECOPETROL the largest and most integrated oil organization in Colombia. The plan visualizes, among other things, US$28 million for exploration and development, US$38.5 million for refining facility expansion, and US$36.6 million for petrochemical industry development. The largest project so far started was a US$22 million expansion of the Barrancabermeja refinery. The contract for this expansion was awarded to M. W. Kellogg Co. and includes a new 26,000-barrel-per-day crude unit to boost the plant's crude-distillation capacity to 70,000 barrels per day, and a vapor-recovery unit which will enable the refinery to produce annually 35 million pounds of ethylene and 22 million pounds of propylene. A 30-ton-per-day sulfur recovery plant also was being built. Completion of the refinery expansion project is scheduled for 1966. Additionally ECOPETROL will construct a 25,000-barrel-per-day refinery at Bogotá, scheduled for completion by 1968, and a smaller plant for the Neiva area.

SOURCE MATERIALS

Statistical data were derived from official publications of the Ministerio de Minas y Petróleos, Banco de la Republica, and the Departamento Administrativo Nacional de Estadistica. U.S. Embassy dispatches from Bogotá also provided useful information. Textual information has been obtained from articles and notes appearing in such trade magazines as Petróleo Interamericano, World Petroleum, Petroleum Press Service, World Oil, World Mining, and the Mining Journal (London). Annual reports of Pato Consolidated Gold Dredging, Ltd., International Mining Corp., and Acerías Paz del Rio were also drawn upon.

The Mineral Industry of Peru

By John Burgess,[1] Sumner M. Anderson,[2] and Hazel B. Comstock[3]

◆

PERU'S mineral industries, as well as its entire economy, continued to prosper and expand in 1964, encouraged by strong world demand and rising prices.

Because of a favorable balance of payments, the Central Bank's net gold and foreign exchange reserves improved by 15 percent to $144.3 million. Labor unrest declined, and there were fewer work stoppages than in the 3 preceding years. Development capital continued to flow into the country.

The slight decline in production of copper was offset by marked increases in production of lead, zinc, silver, and iron ore, and the total value of mineral products was 28 percent above that of 1963.

Indicators of the general economic progress of Peru follow:

	1962	1963	1964
Gross national product (GNP) million U.S. dollars	[r] 2,660	[r] 2,970	[e] 3,478
Population millions	[r] 10.6	[r] 10.8	11.1
GNP per capita dollars	[r] 251	[r] 279	[e] 325
Cost of living index, Lima (1958=100)	[r] 138	148	164
Commodity trade:			
Exports, f.o.b. million U.S. dollars	540	[r] 542	667
Imports, c.i.f. do	[r] 534	[r] 557	580
Trade balance do	[r] 6	[r] –15	87
Net foreign balance, inflow minus outflow do	29	[r] 69	[e] –35
Total mineral production do	[r] 338	[r] 359	[e] 459
Mineral production as percentage of GNP	[r] 12.7	[r] 12.1	[e] 13.2

[e] Estimate. [r] Revised.

Accurate current statistics covering employment in the mining industry were not available, but a list of more than 170 metallic and nonmetallic mining operators reported a total of 45,000 blue-collar employees in 1964, with average take-home pay of about $2.30 per 8-hour shift, and 7,000 white-collar workers averaging $212 per month. These employment figures include workers in all types of mining, concentration, and refining operations for metallic and nonmetallic minerals and individuals employed in bottling water.

In addition to the income for salaries paid blue-collar workers and other employees, Cerro de Pasco Corp. reported that social benefits including housing, schooling, hospitalization, and pensions provided to workers had a value about equal to the cash payments.

---

[1] Minerals attache, U.S. Embassy, Lima, Peru.
[2] Chief Latin America specialist, Division of International Activities.
[3] Mineral specialist, Mineral Resource Development.

Mineral production increased about 10 percent more than increase in the growth in the gross national product (GNP). In 1963 the value of mineral production was equal to 12.1 percent of the GNP, and the value of mineral exports was 37.3 percent of the earnings from total export sales. Estimates for 1964 indicated that mineral production would account for 13.2 percent of the GNP and mineral exports for 41 percent of the earnings from total export sales. The distribution of principal values within the mineral industries in 1964 follows:

Commodity	Value (thousands of U.S. dollars)	Percent of total mineral value
Metals:		
Antimony	396	0.10
Bismuth	3,397	.74
Copper	114,468	24.94
Gold	2,938	.64
Iron ore	41,348	9.01
Lead	32,069	6.99
Molybdenum	272	.06
Silver	44,761	9.75
Zinc	37,286	8.12
Other	32,655	7.11
Total	309,590	67.46
Nonmetals:		
Cement	17,531	3.82
Guano [1]	6,462	1.41
Salt	1,907	.42
Sand and gravel	1,284	.28
Other	7,639	1.66
Total	34,823	7.59
Fuels:		
Coal	1,050	.23
Metallurgical coke	890	.19
Petroleum and its products [e]	112,600	24.53
Total	114,540	24.95
Grand total	458,953	100.00

[e] Estimate.

[1] Commercial grade. Additional quantities of lower grade were produced and sold locally.

Peru continued to be a net importer of petroleum and its derivatives; although production of crude petroleum and natural gas liquids rose from 22,546,000 barrels in 1963 to 24,201,000 barrels, domestic demand, including national and international bunkers, increased from 23,761,000 barrels to 26,609,000 barrels.

PRODUCTION

The metal production statistics presented in table 1 may be regarded essentially as representing recoverable content in all forms. Based on average recoverability experience, the Department of Mines, in reporting production, deducts from the fine metal content of ores and concentrates 5 percent for copper and lead; 10 percent for zinc, iron, manganese, molybdenum, and tungsten; and 35 percent for arsenic, bismuth, cadmium, tin, etc. The Department of Mines also has advised that some of the statistics may be revised when the annual publication of the mineral industry (Anuario de la Industria Minera de Peru—1964) is published.

TABLE 1.—Peru: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Antimony content of—					
Refined bars	324	400	242	352	359
Antimonial lead bars	52	27	42	29	25
Lead-tin-antimony bars	---	2	---	---	---
Total smelter products	376	429	284	381	384
Ore and concentrate for export	441	360	237	[1] 230	230
Total recoverable antimony	817	789	521	[1] 611	614
Arsenic oxide (white arsenic)	393	352	519	620	621
Bismuth content of—					
Refined metal ... kilograms	380,587	387,950	436,811	475,730	674,770
Bismuth-lead bars ... do	27,110	78,785	51,512	84,161	46,377
Total smelter products ... do	407,697	466,735	488,323	559,891	721,147
Concentrate for export ... do	4,368	1,284	3,479	[1] 4,550	11,312
Total recoverable bismuth ... do	412,065	468,019	491,802	[1] 564,441	732,459
Cadmium content of—					
Refined bars ... do	83,696	105,240	106,507	173,359	197,105
Zinc concentrate for export:					
From Cercapuquio ... do	25,499	25,708	21,244	19,137	45,900
From other mines • [1] ... do	[r] 361,000	[r] 475,000	[r] 387,000	[r] 402,000	487,000
Total recoverable cadmium • [1] ... do	[r] 470,000	[r] 606,000	[r] 515,000	[r] 594,000	730,000
Copper content of—					
Refined bars	29,938	33,798	34,419	36,913	37,811
Blister	133,552	146,712	113,414	118,295	114,245
Matte	1,300	1,561	1,778	[r] 2,285	---
Zinc-copper-aluminum bars	---	---	2	8	10
Total smelter products	164,790	182,071	149,613	[r] 157,501	152,066
Copper sulfate	298	397	365	468	668
Ore and concentrate for export	15,755	14,722	15,939	[r] 18,720	20,860
Cement copper for export	878	862	873	[r] 765	885
Total recoverable copper	181,721	198,052	166,790	[r] 177,454	174,479
Gold content of—					
Refined bars ... troy ounces	42,322	50,820	46,749	[r] 43,680	38,227
Gold-silver bars ... do	34,234	22,344	18,983	[r] 7,605	8,713
Copper bars ... do	4,544	4,125	1,253	[r] 1,268	1,357
Total smelter products ... do	81,100	77,289	66,985	[r] 52,553	48,297
Placer gold • ... do	3,215	3,215	3,215	[r] 8,241	7,112
Ore and concentrate for export ... do	56,686	56,914	52,785	[r] 40,225	30,399
Total recoverable gold • ... do	141,001	137,418	122,985	[r] 101,019	85,808
Iron and steel:					
Iron ore ... thousand tons	6,990	8,737	5,949	[r] 6,574	6,605
Steel ingots and castings ... do	60	75	75	73	75
Lead content of—					
Refined bars	73,767	76,147	67,922	[r] 80,772	89,466
Antimonial-lead bars	356	216	406	298	227
Bismuth-lead bars	18	53	34	56	31
Lead-tin-antimony bars	---	17	---	---	---
Total smelter products	74,141	76,433	68,362	[r] 81,126	89,724
Ore and concentrate for export	57,489	59,965	59,814	[r] 66,081	59,515
Total recoverable lead	131,630	136,398	128,176	[r] 147,207	149,239
Manganese ore, 45 percent manganese equivalent	1,501	3,519	6,716	[r] 483	411
Mercury ... 76-pound flasks	3,034	3,001	3,483	[r] 3,092	3,275
Molybdenum sulfide content of concentrate	---	---	8	[r] 536	651
Selenium, refined ... kilograms	4,845	7,396	8,338	8,977	7,619

See footnotes at end of table.

TABLE 1.—Peru: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals—Continued					
Silver content of—					
Refined bars thousand troy ounces	13, 519	15, 955	16, 228	19, 081	20, 604
Sterling bars do	689	798	618	615	655
Gold-silver bars do	475	520	448	[r] 479	315
Copper bars do	1, 533	1, 522	785	[r] 809	831
Matte do	459	471	454	[r] 469	----------
Total smelter products do	16, 675	19, 266	18, 533	[r] 21, 453	22, 405
Ore and concentrate for export thousand troy ounces	14, 080	14, 896	14, 398	[r] 15, 347	14, 638
Total recoverable silver do	30, 755	34, 162	32, 931	[r] 36, 800	37, 043
Tellurium, refined kilograms	26, 918	34, 600	22, 894	12, 081	21, 209
Tin content of—					
Lead-tin-antimony bars long tons	----------	7	----------	----------	----------
Ore and concentrate for export do	6	7	11	[r] 22	22
Total recoverable tin do	6	14	11	[r] 22	22
Tungsten ore, 60 percent WO_3 equivalent	488	388	395	[r] 519	[2] 674
Vanadium concentrate	----------	----------	[3] 360	----------	----------
Zinc content of—					
Refined metal slabs	32, 397	31, 757	32, 753	[r] 54, 698	59, 742
Powder	----------	----------	----------	----------	922
Zinc-copper-aluminum bars	----------	----------	186	[r] 865	1, 039
Total smelter products	32, 397	31, 757	32, 939	[r] 55, 563	61, 703
Sulfate	176	117	137	[r] 191	218
Concentrate for export	145, 549	141, 995	129, 164	[r] 140, 554	169, 044
Total recoverable zinc	178, 122	173, 869	162, 240	[r] 196, 308	230, 965
Nonmetals:					
Barite	109, 600	111, 165	114, 551	[r] 124, 790	132, 389
Bentonite	250	401	265	[r] 371	603
Cement	599, 690	593, 500	700, 568	[r] 756, 495	794, 828
Clays:					
Common	238, 241	241, 624	248, 630	250, 000	252, 000
Refractory	2, 769	3, 308	6, 216	[r] 9, 271	8, 800
Kaolin	601	466	350	294	330
Diatomite	1, 022	1, 858	1, 473	[r] 2, 479	2, 500
Dolomite	707	884	978	[r] 567	1, 500
Feldspar	240	1, 008	292	[r] 220	850
Gypsum:					
Crude:					
For cement (estimate)	20, 968	22, 818	23, 027	30, 000	31, 765
For calcining	33, 511	34, 249	36, 942	35, 000	33, 928
For other uses	8, 023	6, 633	1, 231	2, 000	[e] 4, 500
Total crude	62, 502	63, 700	61, 200	67, 000	[e] 70, 193
Calcined	28, 290	28, 713	31, 247	28, 000	[e] 29, 977
Lime	76, 800	69, 500	79, 923	85, 000	92, 500
Limestone:					
Crude:					
For cement manufacture	848, 147	753, 677	888, 836	982, 000	952, 866
For lime manufacture	104, 777	98, 954	99, 578	143, 000	75, 000
For metallurgical fluxing	15, 852	39, 439	22, 130	30, 000	74, 800
Total crude	968, 776	892, 070	1, 010, 544	1, 155, 000	1, 102, 666
Calcined (lime)	76, 800	69, 500	79, 923	85, 000	[e] 92, 500
Marble, dimension stone	1, 279	1, 300	1, 708	[r] 756	640
Mineral water thousand liters	7, 786	8, 137	6, 006	[r] 5, 628	6, 424
Phosphate, guano:					
Rich	127, 495	142, 937	NA	181, 671	187, 087
Poor	30, 369	16, 261	NA	10, 170	18, 004
Total	157, 864	159, 198	206, 061	191, 841	205, 091
Pyrophyllite	1, 327	2, 602	1, 434	[r] 2, 432	2, 500
Sand and gravel thousand tons	763	814	1, 041	[r] 1, 090	1, 364

See footnotes at end of table.

TABLE 1.—Peru: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Nonmetals—Continued					
Salt:					
Marine	85,618	70,707	76,700	63,500	88,767
From saline springs or wells	10,856	7,572	6,092	[r] 10,017	10,821
Mined rock salt	9,577	9,065	10,849	13,900	9,714
Total	106,051	87,344	93,641	[r] 87,417	109,302
Slate	---	---	---	23	---
Stone, crushed:					
Pegmatite	829	800	---	---	---
Quartz and marble	7,500	6,650	11,300	[r] 334	300
Silica	17,101	18,200	11,155	[r] 64,568	60,000
Total	25,430	25,650	22,455	[r] 64,902	60,300
Talc	244	334	286	172	170
Mineral fuels:					
Anthracite	31,200	20,922	22,469	21,170	31,198
Bituminous coal	131,029	146,186	140,379	[r] 121,559	114,491
Coke	30,475	35,989	39,500	[r] 38,448	28,183
Fuel briquets	5	---	---	---	---
Natural gas ... million cubic feet	29,558	33,710	[r] 42,320	[r] 40,150	45,134
Natural gas liquids ... thousand 42-gallon barrels	997	1,053	1,081	1,078	1,082
Petroleum:					
Crude ... do	19,255	19,371	21,134	21,468	23,119
Refinery products:					
Aviation gasoline ... do	98	54	63	48	46
Motor gasoline ... do	4,854	4,992	5,368	5,443	5,381
Jet fuel ... do	249	329	493	486	725
Kerosine ... do	3,647	3,060	3,000	2,989	3,041
Distillate fuel oil ... do	5,062	5,478	5,989	5,791	5,635
Residual fuel oil ... do	2,454	2,410	2,770	4,531	3,993
Lubricants ... do	48	83	75	60	80
Asphalt ... do	52	87	130	93	129
Coke ... do	2	2	---	1	---
Other ... do	2	4	4	3	2
Total refinery products ... do	16,468	16,499	17,892	19,445	19,032
Refinery fuel and losses ... do	280	290	304	1,111	139

[e] Estimate. [r] Revised. NA Not available.
[1] Data do not add to totals shown because of rounding where estimated figures are included.
[2] Exclusive of small southern Peru hand production.
[3] Exports.

Source: Dirección de Minería. Ministerio De Fomento Y Obras Publicas.

TRADE

Owing to increased exports and higher world prices, the value of mineral exports rose $71.6 million, or 35.5 percent, and accounted for 57 percent of the increase in value of all exports.

Copper was the most important mineral export and ranked second to fishmeal among all Peruvian export commodities. Copper exports, valued at $103.9 million, accounted for 38 percent of the value of all mineral exports. Exports of lead and zinc, valued at $75 million, provided 27.3 percent of the foreign exchange obtained from mineral export sales. For the first time the U.S. import quotas for Peruvian lead were not filled because owing to price differentials it was financially advantageous for the Peruvian producer to ship lead and zinc to Europe and Japan.

TABLE 2.—Peru: Exports of metals and minerals

(Metric tons unless otherwise specified)

	1962	1963	Principal destinations, 1963
Metals:			
Antimony, gross weights:			
Ore	525	1,145	Belgium 358; Japan 267; Argentina 151.
Refined bars	591	263	United States 234; Brazil 29.
Antimony content of—			
Ore	290	635	(1).
Mixed bars [2]	17	------------	
Refined bars	570	250	(1).
Total antimony content	877	885	(1).
Bismuth content of—			
Mixed bars [2]	76	57	All to United States.
Refined bars	667	446	United States 317; United Kingdom 122; Brazil 5.
Total bismuth content	743	503	
Cadmium, refined bars	118	149	United States 61; Netherlands 35; Sweden 14.
Copper, gross weights:			
Ore and concentrate	49,174	52,070	United States 24,629; Japan 23,590; Australia 2,188.
Cement	1,145	1,682	Japan 1,017; United States 665.
Matte	3,601	5,280	All to Japan.
Blister	119,176	114,645	United States 67,330; West Germany 17,637; Belgium 17,621.
Copper content of—			
Ore and concentrate	14,813	15,900	(1).
Cement	679	1,074	(1).
Matte	1,436	2,191	All to Japan.
Blister	118,130	113,990	(1).
Mixed bars [2]	8	165	All to Brazil.
Refined bars	6,462	5,374	Brazil 5,273; Japan 50; Argentina 40.
Electrolytic sheet	30,342	24,676	United Kingdom 9,443; United States 7,104; Netherlands 5,857.
Total copper content	171,870	163,370	(1).
Gold content of—			
Ores, various troy ounces	3,731	3,600	(1).
Concentrates, various do	55,171	36,597	(1).
Mixed bars [2] do	7,567	2,353	(1).
Blister bars do	4,882	1,305	(1).
Sweepings do	48	------------	(1).
Total do	71,399	43,855	(1).
Iron ore	5,149,202	5,748,663	Japan 2,867;423; Canal Zone [3] 603,005; Netherlands 578,448.
Iron and steel:			
Bars, plates and sheets	62	36	Chile 15; Bolivia 12; Ecuador 9.
Scrap	72	------------	
Total	134	36	
Lead, gross weights:			
Ore	7,498	6,370	United States 5,561; West Germany 809.
Concentrate	112,674	122,348	United States 74,134; West Germany 22,799; Japan 13,318.
Lead content of—			
Ore	3,752	3,103	(1).
Concentrate	58,653	62,428	(1).
Mixed bars [2]	228	38	All to United States.
Refined bars	72,519	54,971	United States 19,471; Netherlands 12,102; Italy 6,634.
Total lead content	135,152	120,540	
Manganese ore	6,968	705	All to United States.
Mercury, gross weights:			
Concentrate (sludges)	46	------------	
Crude metal 76-pound flasks	3,508	2,607	United States 1,766; Netherlands 811; Japan 30.
Mercury content of—			
Concentrate (sludges) do	810	------------	
Crude metal do	2,866	2,580	(1).
Total mercury do	3,676	2,580	(1).

See footnotes at end of table

TABLE 2.—Peru: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

	1962	1963	Principal destinations, 1963
Metals—Continued			
Molybdenum:			
Sulfide concentrate.......kilograms..	9,147	950,836	France 432,288; United Kingdom 379,184; West Germany 93,615.
Sulfide (MoS_2) content of concentrate. do....	7,865	848,246	(1).
Molybdenum (Mo) content of concentrate. do....	4,714	508,439	(1).
Selenium:			
Crude metal.................do....	4,833	9,054	United States 3,638; Netherlands 3,119; Italy 1,118.
Selenium content.............do....	4,771	8,965	(1).
Silver:			
Ore.....................kilograms..	------------	57,000	All to United States.
Refined bars...........troy ounces..	18,304,832	15,657,829	United States 5,625,287; West Germany 3,811,888; United Kingdom 2,870,161.
Silver content of			
Ores, of silver and other metals. do....	455,391	395,535	(1).
Concentrates, of silver and other metals. do....	13,942,193	13,171,085	(1).
Copper matte................do....	380,721	500,674	All to Japan.
Blister bars.................do....	829,029	826,995	(1).
Mixed bars[2].................do....	487,697	459,259	(1).
Refined bars.................do....	18,304,082	15,657,795	(1).
Total contained silver.......do....	34,399,113	31,011,343	(1).
Tellurium, cakes and bars..kilograms..	11,545	963	West Germany 798; United States 165.
Tellurium content of—			
Cakes.......................do....	4,529	------------	
Refined bars.................do....	4,174	962	(1).
Total contained tellurium..do....	8,703	962	(1).
Tin content of concentrates..long tons..	[4] 23	27	All to United Kingdom.
Tungsten:			
Ore:			
As shipped.....................	329	244	Japan 188; United Kingdom 44; West Germany 12.
Tungsten trioxide (WO_3) content.[5]	238	175	(1).
Ore, 60 percent WO_3 equivalent....	397	292	(1).
Vanadium concentrate................	360	------------	
Zinc concentrate....................	261,960	269,856	United States 94,339; Belgium 69,464; Japan 37,984.
Zinc content of—			
Concentrate....................	144,368	148,138	(1).
Refined bars and slabs..............	37,299	38,792	Brazil 13,536; United States 6,640; United Kingdom 5,176.
Total zinc content................	181,667	186,930	(1).
Mixed metals, ingots and bars, gross weights:			
Bismuth, with lead and silver.......	126	95	All to United States.
Copper, with silver and gold........	9	165	All to Brazil.
Lead, with silver and gold..........	2	------------	
Lead, with tin and antimony........	33	------------	
Lead, with antimony................	168	------------	
Silver, with gold.......troy ounces..	521,935	485,862	West Germany 444,934; Netherlands 40,928.
Nonmetals:			
Barite, crude........................	84,078	90,151	United States 89,488; Chile 572; Ecuador 91.
Bentonite............................	------------	6	All to Ecuador.
Cement, portland....................	71	17	Bolivia 16; Chile 1.
Cement, refractory..................	32	32	Bolivia 31, Ecuador 1.
Chalk................................	------------	20	All to West Germany.
Clays, refractory....................	1,020	------------	
Gypsum, calcined....................	2	1	All to Ecuador.
Salt..................................	1,027	587	Do.
Stone: Ornamental, porphyry, onyx, marble.	77	88	United States 49; Italy 39.

See footnotes at end of table.

TABLE 2.—Peru: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

	1962	1963	Principal destinations, 1963
Mineral Fuels:			
Anthracite	10,624	7,000	All to Japan.
Coke	------------	3	All to Bolivia.
Petroleum, crude [7]	368,222	376,834	United Kingdom 170,681; Brazil 113,059; Argentina 89,855.
Liquid petroleum gas	114	(6)	All to bunkers.
Natural gasoline	3,219	------------	
Petroleum refinery products:			
Motor gasoline	[7] 363	40	United States 32; Ecuador 8.
Kerosine	682	327	All to Chile.
Distillate fuel oil	219,262	99,022	Chile 68,384; New Zealand 16,983; United Kingdom 6,919; bunkers 6,736.
Residual fuel oil	25,978	30,193	Bunkers 29,175; United Kingdom 990; Canada 28.
Lubricants, including greases	1,231	2,626	Chile 2,601; bunkers 23; Bolivia 2.
Other	408	324	Brazil 199; United Kingdom 70; Argentina 55.
Total	247,924	132,532	Chile 71,320; bunkers 35,934; New Zealand 16,983.

[1] Country distribution not separately reported.
[2] See Mixed Metals listed at end of Metals section of table for gross weights.
[3] To Panama Canal Zone for transshipment; ultimate destinations not reported.
[4] In addition, 7 long tons of refined tin metal imported from Bolivia in 1962 was shipped to the United States. Peru has no tin-refining facilities.
[5] Official report of these figures as metal (W) content believed to be in error.
[6] Less than ½ unit.
[7] In addition, 1,681 metric tons of imported aviation gasoline was reexported.

Source: Estadística del Comercio Exterior 1962, 1963. Ministerio de Hacienda y Comercio, Superintendencia General de Aduanas, Lima.

TABLE 3.—Peru: Exports of selected metals and minerals in 1964 (preliminary)

(Metric tons unless otherwise specified)

Commodity	Quantity	Principal destinations
Metals (metal content unless otherwise specified):		
Antimony	994	United States 400; West Germany 172.
Bismuth	742	United States 489; United Kingdom 96.
Cadmium	212	United States 76; Netherlands 75.
Copper	178,728	United States 101,768; West Germany 28,887.
Gold .... troy ounces	44,383	United States 18,433; West Germany 9,427.
Iron ore (gross weight)	3,711,847	Japan 1,924,582; Netherlands 491,405.
Lead	163,094	United States 55,232; Japan 25,494.
Manganese	401	All to United States.
Mercury .... 76-pound flasks	3,863	United States 3,713; Argentina 150.
Molybdenum sulfide (MoS_2)	684	France 299; United Kingdom 207.
Selenium .... kilograms	11,104	United Kingdom 3,351; Netherlands 3,269.
Silver .... thousand troy ounces	37,785	West Germany 13,764; United States 11,840.
Tellurium .... kilograms	10,229	Netherlands 8,240; Belgium 997.
Tin .... long tons	28	United Kingdom 15; United States 12.
Tungsten ore:		
60 percent WO_3 equivalent	1,079	United States 429; West Germany 346.
Tungsten content .... short tons	64,720	United States 25,762; West Germany 20,747.
Zinc	271,985	United States 71,482; Japan 66,928.
Nonmetals:		
Barite, crude	126,799	United States 101,946; Netherlands 22,494.
Marble	63	Japan 42; Italy 21.
Other	163	All to Ecuador.
Mineral fuels: Anthracite	7,923	All to Japan.

TABLE 4.—Peru: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and its alloys:			
Ingots	572	637	Canada 482; United States 155.
Bars, rods, plates, sheets, bands, wire.	1,638	1,824	United Kingdom 672; West Germany 430; United States 262.
Pipes	8	3	United Kingdom 2; United States 1.
Powder	45	43	West Germany 34; United States 4; Sweden 3.
Cadmium metal ... kilograms	522	--------	
Copper and its alloys:			
Refined bars, rods, sheets, bands, powder.	591	449	West Germany 87; France 51; Japan 47.
Pipes	264	158	Chile 42; United States 26; Canada 22.
Wire	85	164	United States 136; Chile 8; France 8.
Phosphor copper, Muntz metal, others.	218	204	United States 79; West Germany 55; Netherlands 42.
Gold:			
Bars ... troy ounces	73,062	90,818	Canada 87,600; Switzerland 3,218.
Plates, sheets, foil, etc ... do	763	722	West Germany 301; Austria 231; United States 188.
Iron and steel:			
Iron ore	--------	59	All from the Netherlands.
Iron and steel scrap	74	289	Mainly from United States.
Ores of ferroalloying metals	57	10	United States 9; Japan 1.
Ferroalloys	377	436	Chile 143; Rep. of South Africa 133; United States 37.
Iron and steel mill products:			
Cast iron	303	82	West Germany 50; United Kingdom 30; Norway 2.
Bars, rods, structural shapes.	40,894	24,234	Belgium 13,530; West Germany 3,504; United States 1,781.
Rails and fittings	5,619	3,646	West Germany 1,769; United Kingdom 1,295; United States 310.
Plates, sheets, strips, bands, hoops.	38,157	56,185	Japan 30,460; West Germany 13,486; Belgium 3,954.
Galvanized sheets	11,141	11,520	Japan 8,082; Belgium 2,433; United States 861.
Tinplate and terneplate	17,259	17,700	United States 6,854; France 3,043; Japan 2,883.
Wire	8,678	6,942	Belgium 2,286; West Germany 1,785; France 1,546.
Pipe and fittings	25,068	21,275	France 6,452; Japan 3,823; West Germany 3,718.
Lead:			
Sheets and wires	5	10	Mainly from United States.
Pipes	3	(1)	
Granular and powdered	7	2	Mainly from West Germany.
Antimonial lead and type metal	35	78	Denmark 64; United States 5; Belgium 5.
Magnesium metal ... kilograms	5,886	1,997	Mainly from United States.
Nickel:			
Refined metal	2	9	United States 6; Canada 2; United Kingdom 1.
Sheets and plates	1	(1)	
Nickel alloy: Monel metal, bars, pipes, etc.	21	42	West Germany 19; United States 18; Canada 4.
Platinum group metals:			
Platinum, unmanufactured. ... troy ounces	361	280	West Germany 275; United States 5.
Other platinum-group metals ... do	66	64	All from West Germany.
Silver ingots, dust, sheets, etc ... do	5,208	207,404	United Kingdom 204,157; United States 2,090; West Germany 675.
Tin:			
Refined metal ... long tons	62	138	Malaya 48; United Kingdom 46; Bolivia 27.
Babbitt ... do	14	21	United States 10; United Kingdom 7; Canada 4.
Solder ... do	118	57	United Kingdom 20; United States 13; Italy 11.
Zinc:			
Refined ingots, bars, scrap	5	10	All from West Germany.
Plates, lithographic bands, rods, strips.	178	255	West Germany 118; Belgium 71; Switzerland 32.
Granular	38	1	All from United States.
Nonferrous ores, and scorias, not elsewhere specified.	26	1	Mainly from Burma.

See footnote at end of table.

TABLE 4.—Peru: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals:			
Abrasives, natural	976	1,031	United States 899; France 56; Norway 30.
Asbestos, crude	2,415	2,611	Canada 1,884; Rep. of South Africa 386; United States 233.
Cement:			
Portland	21,809	11,559	West Germany 5,751; Venezuela 5,304; United States 335.
White (for stucco)	1,671	1,792	Denmark 771; West Germany 347; France 280.
Clays:			
Ceramic and modeling clays	204	226	West Germany 100; Canada 46; United States 34.
Kaolin and refractory earth	2,316	916	United States 791; West Germany 76; United Kingdom 46.
Fuller's earth, crude	1,995	2,221	West Germany 1,393; United Kingdom 521; United States 217.
Graphite:			
Crude	50	37	United Kingdom 22; Norway 8; United States 5.
Lubricants	544	30	Japan 15; United States 12; United Kingdom 3.
Gypsum, calcined	70	112	United States 60; West Germany 26; Italy 18.
Magnesite, crude or calcined	1,191	957	Mainly from United States.
Mica:			
Book or sheet kilograms	174	466	Japan 185; United Kingdom 180; United States 95.
Scrap do	93,256	101,613	United States 93,936; Norway 5,000; United Kingdom 2,085.
Salt, crude	2,459	3,494	Bahamas 2,268; Chile 1,100; United States 98.
Sands, silica and other	942	605	United States 586; United Kingdom 8; Mexico 6.
Stone, ornamental and construction	148	265	Mainly from Italy.
Sulfur, all forms	15,764	12,949	United States 12,427; Chile 495; Mexico 11.
Talc and steatite	501	612	United States 205; Italy 165; France 89.
Witherite (barium carbonate), crude	(1)	10	All from West Germany.
Other nonmetals	21	35	United States 21; West Germany 13; Switzerland 1.
Mineral fuels:			
Peat	7	10	All from West Germany.
Coke	4,443	8,535	West Germany 7,901; United Kingdom 594; United States 40.
Natural gas liquids	(1)	--------	
Petroleum:			
Crude and partially refined	99	122	Venezuela 102; United States 20.
Refinery products:			
Aviation gasoline	25,172	28,403	All from Netherlands.
Motor gasoline	20,164	47,895	Netherlands 27,071; Venezuela 18,024; United States 2,284.
Kerosine	1	--------	
Distillate fuel oil	522	448	Netherlands 187; Venezuela 115; Colombia 87.
Lubricants, including greases	18,544	17,394	United States 12,097; Netherlands 3,813; United Kingdom 630.
Asphalt	448	358	United States 311; United Kingdom 19; West Germany 17.
Vaseline, paraffin, waxes	9,052	10,241	India 5,421; United States 3,971; Indonesia 423.
Other	641	935	United States 894; United Kingdom 39.
Total refinery products	74,544	105,674	

[1] Less than ½ unit.

Source: Estadística del Comercio Exterior 1962, 1963. Ministerio de Hacienda y Comercio, Superintendencia General de Aduanas, Lima.

COMMODITY REVIEW

METALS

Bismuth.—The Julcani mine of the Cía. de Minas Buenaventura produced 103 tons of bismuth, which was contained in lead-copper-silver concentrates and sold to the Cerro de Pasco smelter. Ore from this mine was the richest in bismuth of any ore mined in Peru.

Cadmium.—The ore richest in cadmium came from the Cercapuquio mine, which produced 45,900 kilograms of cadmium in zinc concentrate that was exported. A study of all the zinc concentrates produced in Peru, other than those of Cerro de Pasco, was made for the Mining Bank of Peru zinc refinery project; it indicated an average cadmium content of 0.24 percent. Recoverable cadmium content of zinc concentrates produced for export has been determined by multiplying this average content by the gross tonnage of zinc concentrates for export, times the recovery factor of 65 percent. To this must be added the refined metal production of Cerro de Pasco to obtain total cadmium production.

Copper.—The slight decrease from 1963 production of copper was attributed to the lower grade ore mined at Toquepala during the year and to a 13-day strike there.

In July 1964 the Japanese company Cía. Minera Condestable, S.A., began operation of a new 300-ton-per-day flotation mill at its mine near Mala. All of the output was shipped to Japan.

The English-controlled Lampa Mining Co., Ltd. which closed its smelter operation at Lima Verde in 1963, continued to produce concentrate from the San Rafael copper mine in the Department of Puno.

The Cerro de Pasco Corp., the largest integrated nonferrous metal producer in Peru, attained another record year owing to increased capital investment and plant modernization and enlargement. Operations at the McCune open pit mine were expanded. Construction of a copper precipitation plant large enough to recover 16 million pounds of copper annually from mine water and leach dumps was started at the town of Cerro de Pasco.

The American Smelting and Refining Company continued exploratory drilling started in 1963 on its Michiquillay porphyry copper property 20 miles east of the city of Cajamarca.

Diamond drill investigation was resumed on the Cerro Verde property of Andes Exploration Co. of Maine, 15 miles west of the city of Arequipa. Exploratory diamond drilling also was in progress on the Cuajones prophyry copper deposit of the Southern Peru Copper Corp., 30 miles north of Toquepala. This property was partially drilled by Cerro de Pasco Corp. in the mid-1940's, but the extent and outline of the ore body was never defined. Plans in 1964 called for the construction of a 50,000-ton flotation plant on the property in 1971.

Gold and Silver.—The reported production of 85,808 ounces of gold was the smallest since 1931. The major part of the decline was in the precious metal mining sector, where cost of production exceeded value in 1964. The Andaray Gold Mines Co. was the only producer of the metal from a lode mine. Output from this small operation in southern

Peru was 7,828 ounces. The company reported development of sufficient ore reserves, averaging 14 grams per ton, to continue operation for a year.

Cerro de Pasco Corp. recovered 38,235 ounces of gold at Oroya, 46 percent of which was obtained from ores and concentrates purchased from mines in the central district.

Operation of the Natomas Company of Peru bucket line dredge at Vizcachani in Puno was suspended in January and resumed in October. During the final 3 months the company recovered 3,648 ounces of fine gold.

The Southern Peru Copper Corp. reported 1,357 ounces of gold contained in the blister copper anodes that it produced during the year.

Initial estimates indicated that Peruvian silver output reached a new record of over 37 million ounces, compared with 36.8 million ounces in 1963. Exports increased 20.7 percent, to nearly 37.8 million ounces valued at $45.37 million, about 16.6 percent of the value of total mineral exports. The Cerro de Pasco Corp. silver production amounted to 21,259,000 ounces, 53 percent of which was obtained from ores and concentrates purchased from mines in the central district. Cerro de Pasco Corp. accounted for 57.4 percent of total Peruvian silver production; Cía. Minera Millotingo was the second largest producer with 2.104 million ounces.

Cía. Minera San Juan de Lucanas, Peru's third largest silver producer, reported milling 135,890 tons of ore from which it recovered 7,457 ounces of gold in bars and concentrates and 1.904 million ounces of silver. The company suspended its mining and milling operations in December and initiated an extensive exploration and development program with plans to resume production in July 1965.

In January Cía. Minera Acre began milling ore from its Machicala mine, 40 miles east of Trujillo, and produced 2,700 ounces of gold, 224,000 ounces of silver, and 75 tons of copper.

Cía. Minera Arcata installed a small concentrator at the Arcata mine in the Province of Condesuyos, Department of Arequipa. Plans were underway to increase capacity of the mill from 50 to 100 tons per day.

Iron Ore.—Marcona Mining Co., which started operating a 1-million-ton Lurgi pellitizing unit at San Nicolas Bay in July 1963, announced plans in 1964 to install a second Lurgi unit there, with annual capacity of 2 million tons of pellets. The new unit was expected to be in operation early in 1967. Marcona was the largest iron ore producer on the west coast of South America and reported reserves of more than 400 million tons.

Pan American Commodities, S.A., the only other Peruvian producer of iron ore, continued to require financial assistance. A loan obtained from the Chase National Bank, New York, N.Y., was guaranteed by the Government of Peru.

Iron and Steel.—The Santa Corp., Sociedad Siderurgica de Chimbote, a semiautonomous Government agency, at its plant at Chimbote 325 miles northwest of Lima, produced 75,215 tons of steel ingots. Output from the merchant mill was 63,790 tons of bars and angles and 1,435 tons of flat structural sections. Construction begun in 1963 was continued on a 550-ton-per-day blast furnace, a plant to cast pig iron, and an oxygen plant with a capacity of 2,000 cubic meters per hour. Plans were announced for erecting a rolling mill in 1965. Completion of all of the new structures would bring the capacity of the steel mill to 350,000 tons per year.

Lead and Zinc.—The record production of 230,965 tons of zinc was 34,657 tons, or 17 percent higher than in 1963. The Cerro de Pasco Corp., largest producer of lead and zinc, reported satisfactory progress on the 7-mile tunnel begun in 1963 to drain and ventilate the Casapalca lead-zinc-silver-copper mine. The work was expected to be completed in 1967. A 750-ton-per-day flotation mill was begun at Cerro's Yauricocha mine 65 miles southwest of Oroya, to produce lead, zinc, and copper concentrates. Arrangements were made to move houses and other buildings near the pit in Cerro de Pasco to other sites, because they were shaken by blasting. Plans were made to enlarge the pit by sinking a new 1,850-foot production shaft to replace the Lourdes shaft.

A flotation mill was constructed in the upper Chincha Alta Valley, to upgrade the lead-zinc ores from the Chavin mine. This property, formerly owned by Ventures, Ltd., a Canadian company, was included in Ventures' assets when the firm was taken over by Falconbridge Nickel Mines, Ltd. A Peruvian group obtained the property later and assigned Falconbridge a 40-percent interest in the Peruvian company, Chavin Mines Corp. Ore reserves are estimated to total 350,000 tons averaging 8.5 percent lead, 11 percent zinc, and 4 ounces of silver per ton. The new 200-ton-per-day mill was scheduled to begin operation in July 1965.

Manganese.—The Gran Bretana mine in the central district was again the only source of manganese ore in Peru. This is a contact metamorphic deposit with limestone. A crosscut driven in 1964 disclosed a zinc ore body, and investigations indicated that the deposit was large enough to support a 300-ton-per-day flotation mill.

Mercury.—The Sociedad Minera El Brocal, S.A., produced all of the mercury in 1964 from the old Santa Barbara mine near Huancavelica. The company treated 68,927 tons of ore containing 0.16 percent mercury and recovered 3,275 flasks of 76 pounds each. Plans were announced to increase production 50 percent by installing screens and a flotation circuit to treat the fines.

Molybdenum.—Southern Peru Copper Corp., the only commercial producer of molybdenum in Peru, recovered 758 tons of molybdenite concentrate averaging 85.9 percent molybdenum disulfide from copper ores at its flotation mill. In addition, a small quantity of molybdenum ore was produced by hand miners from small fissure veins in north-central Peru.

Tungsten.—The only Peruvian production of tungsten officially reported in 1964 came from the Pasto Bueno mine of Malaga Santolalla which had an output of 42,438 recoverable short ton units. Late in the year, Cerro de Pasco's new tungsten flotation section at the Morococha mine went into production, and the company reported recovery from mill tailings of 30 metric tons of tungsten concentrate containing 65 percent tungsten trioxide.

Other.—At its large and complex metallurgical smelting and refining center at Oroya, Cerro de Pasco continued to produce byproducts including bismuth, selenium, tellurium, copper sulfate, and zinc sulfate.

NONMETALS

Barite.—Peru's entire barite output came from the Barmine Co. and Cía Perforadora de Pozos para Irrigación S.A. mines in the Rimac Valley, northeast of Lima. As in 1963, the material was consigned to oil companies operating along the coasts of the Gulf of Mexico, Chile, and Ecuador.

Cement.—The entire Peruvian output of cement in 1964 was for domestic consumption. Production came from six plants: Cía. Peruana de Cemento Portland; Cemento Andino, S.A.; Cía. Cemento Pacasmayo; Cía. Cemento Chicla; Cemento Sur, S.A.; and Cemento Chiclayo, S.A.

The Cemento Sur, S.A., plant, which was started in October 1963, produced throughout 1964. Cemento Chiclayo, S.A., closed its plant in November 1964, owing to financial difficulties. In October 1964 the West Germany firm, Frid. Krupp Maschinen- und Stahlbau Rheinhausen, contracted with the Government of Peru to erect a 500-ton-per-day cement plant at Yura near Arequipa, and construction was begun.

Lime.—Slight additional domestic requirements for lime for agricultural, industrial, and mineral concentration uses accounted for the 9-percent increase in production in 1964.

Salt.—Although production of salt increased by 22,000 tons in 1964, it fell short of domestic consumption by about 1,400 tons. About 10 percent of the total output of 109,302 tons was recovered from salt springs and by solar evaporation of saline waters.

MINERAL FUELS

Coal and Coke.—The Northern Peru Mining Co. produced 5,900 tons of anthracite from its Cuyacuyo property for heat and fuel in its camps. The only other producer was the Cía Carbonera Pallasca, S.A. Of its reported 31,198 tons of washed and sized anthracite, 7,923 tons was exported to Japan. Investigations were begun on various anthracite deposits in the vicinity of Chimbote in an endeavor to produce a metallurgical coke for the Chimbote steel mill. The steel mill continued in 1964 to import its coke from West Germany.

Cerro de Pasco Corp., the only producer of bituminous coal in 1964, reported output of 114,491 tons from its Goyarisquizga mine in the Department of Pasco. Some of this coal was used to produce 28,183 tons of metallurgical coke, all of which was for smelter fuel at Oroya. In addition, it imported 7,500 tons of metallurgical coke from England.

Petroleum.—Although the controversy between the International Petroleum Co. and the Government of Peru over the La Brea property (see 1963 chapter for details) remained unsettled, total production of crude petroleum increased 7.4 percent above 1963.

Petroleum Law 11780 (Petroleum Code) divided Peru into four zones for concession purposes. The Continental Shelf Zone includes all the area 200 miles westward from the coast. The Coastal Zone extends from the Pacific Coast to a contour line to the east 2,000 meters above sea level on the western slope of the Andes. The Sierra Zone comprises all the area between the 2,000-meter contour line on the western slope of the Andes and a 2,000-meter contour line on the eastern slope. The Eastern Zone includes all Peruvian territory east of the 2,000-meter contour line on the eastern slope of the Andes.

No output was recorded in the Sierra Zone. The northwest Coastal Zone and the Continental Shelf zone increased production to 59,739 barrels per day, a gain of 7.9 percent over 1963 production. Total production in those fields accounted for 94.6 percent of Peru's output in 1964. Increases in 1964 were due to the successful completion of development wells and opening of wells shut in during 1963 for lack of a market.

Production in the La Brea y Parinas field was 5.7 percent below that in 1963. The International Petroleum Co. share of total Peruvian crude production was approximately 50 percent. The company estimated that 30 percent of its production was obtained from secondary recovery and that 60 percent of secondary recovery was obtained by waterflooding.

The two oil companies operating in the Eastern Zone accounted for 5.4 percent of Peru's total crude petroleum production. Output went to the Empresa Petrolera Fiscal (EPF) refinery in Iquitos and the Companhia de Petroleo da Amazonia refinery in Manaos, Brazil.

TABLE 5.—Distribution of crude petroleum production by zone and company

(42-gallon barrels)

Zone and company	Production		
	1962	1963	1964
Continental Shelf:			
Belco Petroleum Corp	[r] 389,081	386,740	555,624
Peruvian Pacific Petroleum Co	[r] 165,793	74,152	50,022
Total	554,874	460,892	605,646
Coastal:			
Belco Petroleum Corp	[r] 210,409	181,952	180,181
Empresa Petrolera Fiscal	1,381,313	2,048,192	2,654,771
International Petroleum Co., Lobitos [1]	9,488,800	8,893,016	10,292,890
La Brea y-Parinas	8,110,111	8,603,843	8,114,793
Petrolera Amotape	25,970	20,215	16,337
Total	[r] 19,216,603	19,747,218	21,258,972
Eastern:			
Cía. Pedro "El Oriente", S.A	563,750	505,337	534,163
Cía. Petrolera Ganso Azul	787,944	754,553	720,271
Total	1,351,694	1,259,890	1,254,434
Grand total	[r] 21,123,171	21,468,000	23,119,052

[r] Revised.

[1] Concessions jointly held with Cía, Petrolera Lobitos (Burmah Oil Co.), operated by International Petroleum Co.

The oil industry attributed the country's low level of exploration drilling during 1964 to the inability of the Government and the Congress to agree on a workable solution of the La Brea issue. Only 8 exploratory wells were drilled, 3 of which produced oil, compared with 26 exploratory wells (9 new producers) in 1963. Of 134 wells drilled in 1964 in proved territory, 121 were oil producers and 1 a producer of gas.

Domestic consumption of petroleum products averaged 72,702 barrels per day, an increase of 11.85 percent above the 1963 average of 65,000 barrels per day.

The IPC refinery at Talara, in the northwest coastal section, refined 87.6 percent of the domestic petroleum products, and the Conchan-California S.A., topping plant near Lima refined 10.2 percent. Until the Conchan refinery started operation in 1963, IPC enjoyed a near monopoly in the manufacture of petroleum products. Most of the refinery products were consumed within the country. All of IPC's crude petroleum came from the northwest oilfields, while Conchan imported 546,374 barrels of Boscan (Venezuela) crude. The balance of this refinery's requirements came from the wells of EPF in northwest Peru.

The two small topping plants, EPF on the Amazon River basin in Iquitos and the batch refinery of Ganso Azul at Pucallpa, supplied the market for petroleum products in eastern Peru. Both refineries produced more residual fuel oil (29 percent of the crude) than was required for consumption. The surplus had to be discarded and deposited in pits in the ground.

Lubricating oils imported in bulk were discharged at the port of Callao to be blended by the blending plants there. The capacity of each follows:

	Annual capacity (42-gallon barrels)
Mobil Oil Co. del Peru	55,000
Texas Petroleum Co	35,000
International Petroleum Co. (IPC)	80,000

A fourth blending plant at Callao was under construction for Shell Petroleum Co., to have an annual capacity of 45,000 barrels.

SOURCE MATERIALS

Preliminary mineral production statistics for 1964 were supplied by the Department of Mines, Division of Statistics and Economics; the Mining Bank of Peru; and individual operating companies. The two latter sources also provided preliminary statistics on mineral exports, but the final official trade statistics, usually released a year later, are published in the annual Statistics of Foreign Trade (Estadistica del Comercio Exterior) by the Superintendency of Customs, Ministry of Treasury and Commerce. These sources give Peru the most comprehensive, detailed, and reliable statistical coverage of mineral activities of any country in Latin America. This basic information has been supplemented by general economic data from the Central Reserve Bank, the Mining Bank of Peru, and the Economic Data Book for Latin America prepared by the U.S. Agency for International Development. Details have been gleaned from field observations and conversations and from articles and notes appearing in such trade and news media as the "Engineering and Mining Journal", "Mining and Metallurgy", "The Mining World", "The Mining Journal (London)", "World Oil," and "The Peruvian Times."

The Mineral Industry of Surinam

By Garn A. Rynearson[1]

◆

STRONG world demand for aluminum helped Surinam's bauxite producers attain record production levels in 1964. Total production and exports of processed bauxite increased more than 0.5 million tons to almost 4 million metric tons, and Surinam easily retained its position as the world's third largest producer. Construction of the country's first alumina refinery and aluminum smelter and the associated hydroelectric installations neared completion, and the first units of the complex were expected to be in operation in the later part of 1965. The Government proceeded with the exploration of virgin bauxite deposits in western Surinam and began formulating more definite plans and recommendations for the exploitation of these deposits.

The only significant new development in other sectors of the mineral industry during the year was the completion of the first test well for petroleum and gas in the continental shelf area off Surinam. Although this well did not prove the existence of such deposits, the geological data obtained were encouraging and the exploratory work will be continued.

GOVERNMENT POLICIES AND PROGRAMS

The Geological and Mining Service continued its investigations of the high-level bauxite deposits in the Adampada-Kabalebo area of the Bakhuis Mountains of Nickerie District but did not announce any significant new results. At the same time a Bauxite Commission, appointed to formulate recommendations on the granting of concessions for these and other possible deposits in western Surinam, concluded that the exploitation of Bakhuis bauxite would be too costly for a single company to undertake and therefore recommended the formation of a consortium of several companies. The commission's report suggested that such a consortium might consist of the two companies now producing bauxite—Suriname Aluminum Co. (Suralco) and N.V. Billiton Maatschappij—as well as Surinam Minerals Corp. (Ormet), Bridgeport Brass Co. (Alcan), and Compagnie Belge pour l'Industrie de l'Aluminium. Division of the area among the several companies was rejected as economically unfeasible, because of both technical and administrative difficulties of such a division.

---

[1] Physical scientist, Division of International Activities.

The commission further suggested that any concession agreement with a consortium should include the following terms: (1) The exploration period should be 3 years, with an optional 1-year extension, during which time a specified minimum expenditure should be required; (2) exploitation should begin within 4 years after termination of exploration with a minimum annual production of 1 million tons; (3) obligatory reduction to alumina, in Surinam, of at least 25 percent of the bauxite produced and, if economically feasible, the smelting of part of this alumina to metal; (4) existing bauxite operations should be continued at the present levels and be fiscally separate from those in the Bakhuis region.

The commission also made recommendations concerning the granting of new concessions for bauxite deposits in the coastal plain area of western Surinam. It was suggested that Harvey Aluminum Co. be granted a concession of 388,000 hectares under terms similar to those proposed for the consortium and that Reynolds Metals Co. be granted a concession of about 49,750 hectares; no special terms were specified for the latter.

Although the commission's recommendations are not binding, the Government apparently favors an undertaking in the Bakhuis region that would include two or more companies, and it seems likely that any concession agreement will include provisions regarding domestic reduction of part of the bauxite to alumina if not to metal.

The Surinam Government engaged the West German engineering consulting firm of Salzgitter Baugesellschaft m.b.H. to make a series of feasibility studies which will include a survey of the possibility of mining and processing iron ore, a study of the costs involved in improving and expanding the present road, water, and harbor systems to accommodate future enterprises that may be in the remote, undeveloped areas of the country, and a study of potential hydroelectric resources. It is hoped that these studies will provide a basis for development planning and also help to attract foreign capital investment in new mining and other projects.

PRODUCTION

The total value of processed bauxite produced and exported from Surinam in 1964 was $38.9 million,[2] compared with $35.4 million in 1963. These are assigned rather than actual values and are based on a formula that takes into account variations in price indices for iron and steel, aluminum, and finished aluminum products. The Government collected royalties amounting to $1.71 million on the bauxite produced. In addition, the bauxite companies accounted for nearly two-thirds (approximately $7.6 million) of all Surinam's income taxes. The bauxite industry thus provided about 20 percent of the total government revenue for the year.

Value data for other mineral commodities are incomplete. Reported output of gold, sand, and crushed stone was valued at about $354,000. No information is available on the value of other sand and gravel, clays, clay brick, and manufactured gas produced.

---

[2] Where necessary, values have been converted from Surinam guilders or florins (Sur. f) at the rate of Sur. f1 equals US$0.535.

For the first time, company data were available from which it has been possible to estimate the dry bauxite equivalent of the dried and calcined products shipped from Surinam in recent years. It is anticipated that additional company data will be made available in the future, permitting a more precise determination of dry bauxite equivalent for both production and shipments of Surinam bauxite products and for the raw, wet bauxite ore that will be processed into alumina within the country. Average composition of Suralco bauxite shipments in 1964 follows:

Constituent	Percent				
	Moengo plant			Paranam plant	
	Metallurgical grade	Chemical grade	Abrasive grade	Metallurgical grade	Refractory grade
Al_2O_3	55.60	61.24	86.91	54.79	88.40
Fe_2O_3	9.03	1.44	5.55	10.26	1.50
TiO_2	2.74	3.12	3.53	2.26	3.65
SiO_2	2.87	2.52	3.26	4.47	6.38
Loss on ignition	29.76	31.68	.75	28.22	.07
Total	100.00	100.00	100.00	100.00	100.00
Free moisture	2.86	2.71	.38	2.76	Negligible

Bauxite production statistics for Surinam do not include data, on either a wet or a dry basis, for output of crude bauxite other than the low-grade, high-iron material produced by one company for road surfacing and similar uses. Company officials have indicated that no record is made of the actual quantity of crude bauxite mined and beneficiated for further processing. Furthermore, published statistics for total production and export of "bauxite" are somewhat misleading because they represent a summation of quantities of distinctly unlike products. For example, the kiln-dried metallurgical and chemical-grade bauxite containing from 2 to 4 percent free moisture and about 30 percent water chemically combined with other constituents has been added with the calcined abrasive and refractory grades containing virtually no free moisture or combined water, whereas 1 ton of this calcined material is actually equivalent to roughly 1.5 tons of the dried product. Thus, Surinam data as published are not directly comparable with those of other countries, such as Jamaica, the Dominican Republic, and the United States, which report production in terms of dry bauxite equivalent.

TABLE 1.—Surinam: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum: Bauxite and bauxite products:					
Crude, for road surfacing and similar uses, dry bauxite equivalent [1]	49,025	46,833	50,207	70,198	113,372
Processed, for metallurgical, chemical, abrasive, and refractory uses:					
Production, all grades, gross weight	3,455,000	[r] 3,453,000	[r] 3,297,000	[r] 3,438,000	[r] 3,993,000
Shipments:					
Dried, gross weight	3,471,107	3,253,309	3,060,738	3,271,815	3,748,773
Calcined, gross weight	163,970	150,303	189,749	210,374	235,465
Total	3,635,077	3,403,612	3,250,487	3,482,189	3,984,238
Dry bauxite equivalent [2]	3,607,500	3,373,300	3,242,200	3,477,800	3,975,900
Columbium-tantalum ore	-------	-------	-------	[3] 2	NA
Gold troy ounces	4,932	4,011	[r] 2,592	[r] 3,548	8,258
Tin: Cassiterite concentrates long tons	-------	-------	-------	[3] 2	NA
Nonmetals:					
Clay brick cubic meters	170	841	1,316	2,316	1,827
Lithium minerals: Amblygonite (exports)	-------	431	750	515	NA
Sand, quarry type	8,184	8,895	8,366	7,671	5,725
Stone, crushed	18,644	18,750	[r] 17,006	14,782	9,629
Mineral fuels: Gas, manufactured million cubic feet	145	154	164	170	180

[r] Revised. NA Not available.

[1] Data are not available for crude bauxite produced for processing into dried and calcined products.

[2] Calculated on the basis of known average moisture content of dried bauxite shipped by Suriname Aluminum Co., an approximate moisture content of 3 percent for dried bauxite shipped by N. V. Billiton Maatschappij, and an estimated average of 30 percent for the chemically combined water content of bauxite that was calcined.

[3] Imports from Surinam by the Netherlands. The Netherlands also imported 11 tons of unspecified metallic ores from Surinam in 1963, most or all of which was cassiterite or columbite-tantalite or both.

TRADE

Foreign trade attained record proportions in 1964 as the total value of exports of domestic products increased by $1.4 million to $47.5 million and the value of imports increased by $22.4 million to $81.4 million. Considerably greater exports of bauxite products accounted for the actual gain in export value and also compensated for a 20-percent decrease in the aggregate value of all other export commodities to $8.6 million. The remarkable rise of 38 percent in imports was attributed mainly to unusually large imports of capital equipment, most of which was destined for the rapidly expanding bauxite mining and processing industry.

The total value of metal and mineral exports, excluding reexports, was $38.9 million in 1964, compared with $35.4 million in 1963 and $33.5 million in 1962. Bauxite represented 99.9 percent of this total and 82 percent of the total for all export commodities. Imports of metals and minerals in 1964 were valued at $13.0 million, compared with $9.9 million in 1963 and $10.3 million in 1962; the increase was attributed principally to much larger imports of iron, steel, and aluminum semimanufactures.

TABLE 2.—Surinam: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Bauxite, all grades	3,254,301	3,482,142	United States 2,976,317; Canada 493,649, Spain 6,381.
Metal, all forms (reexports)[1]	6	3	Netherlands 2; United Kingdom 1.
Copper, unwrought (reexports)[1]	54	60	West Germany 56; Netherlands 4.
Iron and steel (reexports):			
Unwrought[1]	751	1,150	All to Netherlands.
Semimanufactures	6	10	Netherlands 5; United States 5.
Lead, unwrought (reexports)[1]	24	17	Netherlands 9; West Germany 8.
Metallic ores, slag, ash, not elsewhere specified	------------	[2] 10	All to Netherlands.
Nonmetals:			
Amblygonite	750	515	All to West Germany.
Cement (reexports)	10	21	All to Brazil.
Salt (reexports)	------------	30	All to British Guiana.
Sand, clay, earth	6,662	4,978	Brazil 2,566; Netherlands Antilles 2,400; British Guiana 12.
Other (reexports)[3]	------------	4	Netherlands Antilles 3; British Guiana 1.
Mineral fuels (reexports):			
Petroleum refinery products:			
Gasoline ...42-gallon barrels	6	------------	
Kerosine ...do	------------	17	All to British Guiana.
Distillate fuel oil ...do	38	------------	
Lubricating oil ...do	153	385	French Guiana 244; Trinidad and Tobago 137; British Guiana 3.
Other ...do	4	(4)	All to French Guiana.
Asphalt, natural bitumens, mixtures	(4)	5	All to Netherlands Antilles.
Mineral tar[5]	19	8	All to British Guiana.

[1] Apparently includes scrap derived from imported metal and metal products.

[2] Excludes amblygonite exports to West Germany. Netherlands data on imports from Surinam indicate most, if not all, of quantity shown was cassiterite and columbite-tantalite concentrates.

[3] Largely miscellaneous construction materials and fertilizer.

[4] Less than ½ unit.

[5] Includes domestic as well as reexported products.

Source: Algemeen Bureau voor de Statistiek, Suriname: Jaarstatistiek van de in-en uitvoer per goederensoort en per land, 1962, and Maandstatistiek van de in - en uitvoer per goederensoort e nper land, December 1963 (cumulative).

TABLE 3.—Surinam: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum, semimanufactures	112	200	United States 137; United Kingdom 28; Netherlands 15.
Copper:			
Unwrought	------------	1	All from Netherlands.
Semimanufactures	67	58	United Kingdom 26; Netherlands 17; United States 13.
Iron and steel:			
Unwrought	39	(1)	All from United States.
Semimanufactures	9,536	12,021	Netherlands 5,580; Belgium 3,486; Japan 1,150.
Gold, unwrought ...troy ounces	20	1,622	Netherlands 1,608; United Kingdom 10; French Guiana 4.
Lead, semimanufactures	24	39	Netherlands 37; United States 2.
Magnesium, semimanufactures. ...kilograms	------------	400	All from Netherlands.
Mercury ...76-pound flasks	1	8	Mainly from Netherlands.
Nickel, semimanufactures	(1)	(1)	All from West Germany.
Tin, semimanufactures. ...long tons	3	5	Mainly from Netherlands.
Zinc, all forms	(1)	(1)	Mainly from Netherlands.
Metallic ores, slag, ash, not further specified.	9,073	2,264	All from United States.

See footnotes at end of table.

Table 3.—Surinam: Imports of metals and minerals—continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals:			
Abrasives, natural	2	2	All from Netherlands.
Asbestos and asbestos-cement building materials.	756	732	United States 288; Belgium 130; Netherlands 125.
Cement:			
Refractory	41	14	Netherlands 6; Belgium 5; United States 3.
Other	81,862	49,390	Venezuela 45,895; Netherlands 2,183; Dominican Republic 856.
Chalk	199	162	Netherlands 132; Belgium 30.
Clay building materials, nonrefractory.	859	413	Czechoslovakia 177; Netherlands 156; West Germany 37.
Earths, pigment and siliceous	48	7	Netherlands 6; United States 1.
Fertilizer materials:			
Nitrogenous	2,461	2,683	Netherlands 2,128; United States 480; Trinidad and Tobago 75.
Phosphatic	120	59	All from Netherlands.
Potassic	77	74	All from Netherlands.
Not specified	235	289	Netherlands 273; United States 16.
Total	2,893	3,105	Netherlands 2,534; United States 496; Trinidad and Tobago 75.
Lime	73	264	Netherlands 131; United Kingdom 51; Trinidad and Tobago 41.
Refractory brick and similar products.	628	327	United States 287; Netherlands 39; United Kingdom 1.
Salt	994	1,196	West Germany 737; Netherlands 365; British Guiana 54.
Sand, clays, earth, not further specified.	12	159	United States 97; Netherlands 42; United Kingdom 20.
Stone:			
Dimension, not worked and worked.	116	215	Netherlands 118; British Guiana 64; United States 33.
Broken stone, gravel, macadam	20,090	5,609	Netherlands Antilles 3,150; British Guiana 1,830; Trinidad and Tobago 622.
Other	64	92	Italy 59; Netherlands 33.
Other [2]	58	26	Netherlands 16; United States 6; United Kingdom 3.
Mineral fuels:			
Solid fuels:			
Coal	119	37	Netherlands 26; United States 11.
Other, not specified	42	51	Netherlands 36; West Germany 15.
Gases, liquefied:			
LP-gases	659	1,651	Mainly from Trinidad and Tobago.
Manufactured	6	72	Trinidad and Tobago 70; United States 2.
Petroleum refinery products: [3]			
Gasoline:			
Aviation thousand 42-gallon barrels	9	9	Mainly from Trinidad and Tobago.
Other do	141	139	Mainly from Trinidad and Tobago.
Kerosine do	43	42	Mainly from Trinidad and Tobago.
Distillate fuel oil do	460	501	Trinidad and Tobago 499; British Guiana 2.
Residual fuel oil do	492	546	Trinidad and Tobago 544; British Guiana 2.
Lubricating oil do	24	25	United States 16; Netherlands 6; Netherlands Antilles 1.
Paraffin and vaseline	42	42	Netherlands 15; United States 14; West Germany 13.
Other do	1	2	Mainly from Trinidad and Tobago.
Asphalt, natural bitumens, mixtures [4].	4,052	536	Trinidad and Tobago 467; Netherlands 34; United States 27.
Benzol, toluol, xylol	187	58	Netherlands 30; United States 28.
Mineral tar and pitch	89	77	Netherlands 52; United States 25.

---

[1] Less than ½ unit.

[2] Includes some materials not identified by commodity in source and commodities not listed separately in table.

[3] Excluding LPG and petroleum asphalt.

[4] May include some refinery asphalt.

Source: Algemeen Bureau voor de Statistiek, Suriname: Jaarstatistiek van de in- en uitvoer per goederensoort en per land, 1962, and Maandstatistiek van de in- en uitvoer per goederensoort en per land, December 1963 (cumulative).

As in previous years, the bulk of the bauxite exported from Surinam was destined for use in the United States and Canada. Official export statistics do not indicate all countries that receive Surinam bauxite, because part of that credited to the United States is actually delivered to customers in Japan and many West European countries. Colombia and Argentina were the principal recipients in South America.

TABLE 4.—Bauxite shipments from Surinam

(Metric tons)

Company and destination	1963	1964
Suriname Aluminum Co.:		
United States and Canada	2,200,678	2,427,629
Europe	73,191	80,346
Japan	9,146	16,772
Colombia	617	----------
Total	[1] 2,283,633	2,524,747
N.V. Billiton Mij.:		
United States	553,403	846,531
Canada	379,710	604,168
Europe	8,612	2,080
South America	2,093	6,237
Netherlands Antilles	201	475
Undisclosed	[2] 254,537	----------
Total	1,198,556	1,459,491
Grand total	3,482,189	3,984,238

[1] Includes 1 metric ton shipped to the Philippines.
[2] Destinations not available for 4th quarter shipments; however, the United States and Canada were the principal recipients.

COMMODITY REVIEW

METALS

Aluminum.—The Suriname Aluminum Co. (Suralco), a wholly owned subsidiary of Aluminum Company of America (Alcoa), was expanding its bauxite-alumina-aluminum operations during 1964. Construction on the hydroelectric, refining, and smelting projects being undertaken under the terms of the Brokopondo Agreement progressed on or well ahead of original schedules. New bauxite mines in both the Moengo and Paranam areas began full-scale operations. In addition, the company increased its total output of processed bauxite products slightly more than 11 percent, from 2,270,094 tons in 1963 to 2,525,055 tons in 1964. Exploration of the concession area east of the Surinam River and north of the fourth parallel continued, but results thus far have been disappointing and company officials have indicated little hope of finding new deposits of commercial interest in the area.

The Adjoema mine at Adjoemakondre Hill in the Moengo area was opened in the latter part of June to replace the Ricanau mine as the principal supplier of crude bauxite for the Moengo mill. Equipment used at the new mine includes hydraulic augur drills, small power shovels, and small trucks; an ammonium nitrate-diesel fuel mixture is used as the blasting agent. The Moengo-Ricanau railroad was extended 5 kilometers to provide haulage to Moengo. At yearend about one million tons of bottom ore remained to be mined at Ricanau Hill.

Approximately half of Suralco's bauxite output in the Paranam area during 1964 came from the Rorac deposits, reducing the reserve to about 500,000 tons. The other half was supplied by the mine at the Onoribo II deposit, which completed its first full year of normal operation. Preparation of the more important Onoribo IV deposit, which lies below sea level, was virtually completed and the first cut in ore was started after more than 10 years of exploration and development. This ore body and the similar but undeveloped Lelydorp ore body to the west represent the bulk of Suralco's bauxite reserve in the Paranam area.

Total shipments of bauxite by Suralco during 1964 were the highest since 1959, with increases in all grades except chemical grade, shipments of which were the lowest in a decade. According to company officials, production of chemical-grade bauxite probably will be discontinued when present contracts run out at the end of 1966. Production of abrasive-grade bauxite is to be maintained at roughly the 1964 level. Although demand for this grade is high, output is limited by the amount of suitable raw bauxite that becomes available as the overlying metal-grade bauxite is mined.

TABLE 5.—Suralco bauxite shipments by grade and plant

(Metric tons)

Grade	1963		1964	
	Moengo	Paranam	Moengo	Paranam
Metallurgical	r 1,434,377	562,432	1,546,246	686,430
Chemical	76,450	------------	56,606	------------
Abrasive	r 182,931	1,525	193,493	------------
Refractory	(1)	25,918	------------	41,972
Total	r 1,693,758	589,875	1,796,345	728,402

r Revised.

[1] Revised to none.

Suralco closed the gates of the new dam on the Surinam River at Affobakka on February 1, and by yearend virtually all work on the structure had been completed. The powerplant was about half finished, and the transmission lines to Paranam were almost completed during the year. It was hoped that sufficient water would be impounded by the fall of 1965 to permit the generation of the electric power required to operate the new aluminum smelter at Paranam. When completed, the powerplant will have six 30,000-kilowatt turbine-generator units; but one unit normally will be held in a standby status so the operational capacity will be 150,000 kilowatts.

Construction of Surinam's first facilities for producing alumina and virgin aluminum metal was well underway at yearend. The first of two 200,000-metric-ton alumina units was expected to be ready for operation in the latter part of July, and the second unit was scheduled for completion during September 1965. Other similar units may be added. The units are designed to utilize the standard American Bayer (Alcoa-Bayer) process. Suralco will process its own as well as some Billiton bauxite in the new plant.

Official dedication of the new 60,000-metric-ton aluminum smelter was scheduled for October 25, 1965, with actual operation being contingent on the availablity of sufficient electric power from Affobakka. The smelter comprises two 76-cell potlines housed in the four main buildings. Soderberg anodes will be used. The plant also includes remelting facilities so that alloys as well as crude metal can be made in Surinam.

N.V. Billiton Maatschappij commemorated 25 years of activity in Surinam's bauxite industry with new records in both production and shipment of dried bauxite. Production in 1964 was 1,468,000 tons, compared with 1,167,000 tons in 1963, and shipments increased from 1,198,556 to 1,459,491 tons. Accelerating production will be facilitated by a second large bucket-wheel excavator which began operating in October 1964. Wheel diameter of this machine is about 30 feet. The excavators are used to strip overburden from the bauxite deposits and the smaller one, which began operating in 1962, moved 2.2 million cubic meters of overburden during 1964. Although the company apparently has adequate ore reserves for some years to come, it has indicated that no new ore bodies are likely to be found in the concession areas held as of 1964 and that new concessions are being sought.

Suralco has contracted to supply Billiton annually with up to 130,000 tons of alumina to be made from Billiton bauxite at Suralco's new refinery. Billiton announced it may also exercise options for additional amounts of alumina. A part of this alumina is contracted to Phelps Dodge Corp. and will be converted to aluminum (approximately 30,000 tons per year) on a toll basis by Consolidated Aluminum Corp. at its new smelter at New Johnsonville, Tenn. Phelps Dodge reportedly will provide funds to help finance expansion of Billiton's Surinam operations.

Billiton also will supply alumina for the new smelter being constructed at Delfzijl, Netherlands, in which the parent company has a one-sixth interest; Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V. and Schweizerische Aluminium Industrie AG (Alusuisse) have one-half and one-third interests in the smelter project. The Delfzijl smelter is to have an initial capacity of 30,000 tons and is scheduled to start production in the latter part of 1966.

Gold.—Total production of gold during 1964 was more than double that of the previous year and was greater than in any year since 1941 when output amounted to 12,563 ounces. The bucketline dredge of Northshore Goldfields, Ltd., which began operating along Rufin Creek in the Lawa River area in 1963, accounted for the major portion of the gold recovered. This dredging operation reportedly has attained maximum capacity, and no appreciable increase in production is foreseen.

NONMETALS

Construction Materials.—Suralco continued to be a major producer of locally available mineral products required for its several construction projects. In addition to sand and gravel for concrete, the company has produced bauxitic material for surfacing roads and other service areas. Most of this material utilized during 1963 and 1964 was derived from the high-iron capping of bauxite deposits in the Paranam area, but some continued to be derived from the "sink" fraction of the heavy-media separation plant at Rorac. This plant, which employed a magnetite-ferrosilicon mixture as a heavy medium, was to be dismantled in the near future.

Lithium Minerals (Amblygonite).—The concession to exploit the lithium pegmatite in the Jorka Creek area on the Lower Marowijne River was transferred from Billiton to J. W. Harris, a U.S. mining engineer, who continued to work the deposit for amblygonite. Some amblygonite was recovered and exported during 1964, but the total amount was not reported.

MINERAL FUELS

Manufactured Gas.—Gas for illuminating and cooking was supplied by pipeline to users in Paramaribo by N. V. Overzeese Gas-en Electriciteitmaatschappij (OGEM). The gas, made from imported diesel oil by a cracking process, has a low heating value of about 425 Btu per cubic foot. Because of limited demand, the plant operated at about one-half of its maximum daily capacity of about 1 million cubic feet. Bottled gas for commercial use and for customers outside the company's pipeline service area was imported from Trinidad. All other mineral fuels consumed in the country also were imported.

Petroleum.—Colmar Surinam Oil Co., controlled by Gulf States Land and Industries, Inc., of New York, completed the first wildcat well to be drilled on the continental shelf off the coast of Surinam. The well was drilled from the drilling ship *Western Explorer* in waters 146 feet deep about 55 miles north of Paramaribo. The hole was bottomed at 4,428 feet and abandoned at the end of February. It reportedly encountered good but noncommercial indications of oil and gas and proved the existence of a thick sequence of sediments, including a section of carbonate rocks below 1,600 feet with zones of good permeability and porosity. Plans for further wildcat drilling and additional seismic work were suspended for the remainder of the year while the concession agreement was being renegotiated to include joint participation by a consortium of French companies including Bureau de Recherches de Pétrole, Régie Autonome de Pétrole, and Société de Recherches et d'Exploitation de Pétrole (EURAFREP). The group will coordinate exploration of jointly held offshore concessions granted by Surinam and French Guiana.

SOURCE MATERIALS

Foreign trade statistics were derived from trade publications of the General Bureau of Statistics for Surinam. Production statistics were compiled from other publications of this Bureau, from data gathered by the U.S. Consulate General at Paramaribo, and from information supplied by the bauxite companies. These companies also provided detailed information concerning their bauxite operations, either through the consulate or by direct communication with the Bureau of Mines. Other information given in this chapter is based on consular dispatches augmented by reports on petroleum developments published in the August 1965 issue of the Journal of the American Association of Petroleum Geologists and the March 15, 1965 issue of "World Petroleum Report."

The Mineral Industry of Venezuela

By Benjamin H. Lim [1]

CRUDE oil production continued to be the dominant element of the Venezuelan mineral industry in 1964. The value of crude petroleum output, about $2,500 million,[2] was equivalent to about 26 percent of the nation's gross national product of $9,500 million.[3] Crude petroleum far exceeded the gross earnings of iron ore, the nation's second-ranked crude mineral product, which totaled about $110 million in 1964. In 1964, iron ore registered an increase of about a third over the 1963 output as the declining production trend of 1961–63 was reversed. Other more important crude mineral industry products included diamond, valued at about $3 million, and gold, valued at about $2 million, according to reports by the country's Ministry of Mines and Hydrocarbons.

All told, the value of minerals and mineral products produced in Venezuela in 1964 (including steel, cement, and petroleum refinery products) was estimated at about $4,300 million, or equivalent to about 45 percent of the GNP.

As in past years, much of the country's 1964 mineral output was exported. Venezuela was the world's leading exporter of crude petroleum and ranked second among countries exporting iron ore to the United States. Iron ore also was a major export to Western Europe. Mineral imports were mostly iron and steel and other metal semimanufactures; these commodities accounted for approximately 85 percent of the country's total 1964 mineral imports. The extraordinary mineral wealth of Venezuela has been largely responsible for the country's favorable balance of trade—$1,000 million to $2,000 million a year during the last decade.

Domestic consumption of the country's mineral wealth has been rising steadily in the last few years as the Venezuelan Government has restructured the nation's economy through various economic plans. It has endeavored to enlarge manufacturing to provide greater employment and to stabilize the economy by reducing the relative importance of traditional primary mineral exports as foreign exchange earners. For example, the petroleum industry accounted for nearly a third of the country's GNP and yet employed only about 2 percent of the work force. Economic plans of the present Venezuelan Government have stressed heavily the construction of basic mineral industries. In 1963 and 1964, the Government-owned plants including the Matanzas Steel plant and several petrochemical installations went into production with measurable success.

---

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from bolivaries (Bs) to U.S. dollars at the rate of Bs 3.09 equal US$1.00.

[3] The value cited in President Leone's economic report for 1964.

The Government passed a resolution in late 1964 to increase domestic consumption of gasoline through construction of a network of gasoline retail stations.

GOVERNMENT POLICIES AND PROGRAMS

The current 4-year national plan (1963–66) continued to stress the construction of a more balanced economy by lessening Venezuela's economic dependence on petroleum and also by promoting the mineral manufacturing sector. To implement these goals, the Government had begun in 1959 to establish various incentives for private firms to invest in manufacturing, such as exoneration from import duties of raw materials, machinery, and equipment used in manufacturing, extending technical aid from the Corporación Venezolana de Fomento (Venezuelan Development Corp.—CVF), and granting Government long-term, low-interest loans. From 1959–64, approximately $400 million in CVF aid have been dispersed. By and large, only private manufacturing concerns were established; that is, firms with small capitalization producing primarily for the domestic market as substitutes for imports.

In 1964, the Government implemented the shift of emphasis from consumer goods industries to basic industries that had been announced in early 1963. These industries included aluminum and other nonferrous metal industries, basic iron and steel, cement and other nonmetallic industries, paper and pulp, petrochemicals, and rubber.

In November, the Government revised old policies and formulated new programs to increase cooperation with the business sector and spur the economic program. In December CVF announced a policy of direct promotion in which the development agency would design specific projects and attempt to generate private interest in them. These projects would be strictly tied in with basic industries and assigned a priority rating in terms of financial aid and time of construction. By such direct promotion and control, CVF hoped to establish initially 82 facilities to produce the following chemical and metal products: Sodium carbonate, magnesite, aluminum sulfate, sulfur, various petrochemicals, ferrous and nonferrous semimanufactured and finished goods, and various equipment for the agricultural, mining, and petroleum industries.

Complementing the industrialization program, the Venezuelan Government in 1964 granted the Ministry of Mines and Hydrocarbons approximately $22 million, of which about $8 million has been used for geological exploration and for opening new mines. To promote a more equitable distribution of economic development, a law was passed in late 1964 creating the Andean Corporation (Corporación de los Andes), an autonomous agency having the basic objective of developing the mineral resources in Venezuela's Andean region.

PRODUCTION

Significant production gains were registered by a few minerals during 1964. Of the major minerals, iron ore production increased about

4 million tons, and petroleum production averaged approximately 3.4 million barrels per day in 1964, an increase of about 5 percent compared with the preceding year's rate. Venezuelan officials pointed out, however, that despite the increases in petroleum and iron ore production, revenues would not correspond percentage-wise inasmuch as prices for these commodities eroded about 3 percent during 1964 compared with the 1963 prices. Of the minor minerals, gold and diamond output made respective gains of 24 and 66 percent in 1964 compared with the 1963 figures. Iron and steel production, mostly semimanufactures, was 151 percent above the 1963 level. This significant increase was largely due to the continued expansion of the Government's giant Guayana iron and steel complex. The rapidity of Guayana's growth was reflected by a population increase in Ciudad Guayana, the central metropolis of the complex. In 1950 the city had a population of only 4,000. At yearend 1964, the population had swelled to over 80,000, making it the fastest growing community in Latin America.

TABLE 1.—Venezuela: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Gold...troy ounces	48,868	30,071	28,774	26,947	33,536
Iron ore...thousand tons	19,490	14,565	13,266	r 11,747	15,650
Iron and steel:					
Pig iron...do	----	5	r 123	302	324
Steel ingots and castings...do	47	75	225	364	440
Semimanufactures...do	51	NA	83	159	399
Nickel, in ore	13	----	----	----	----
Nonmetals:					
Asbestos	3,931	590	----	----	----
Cement...thousand tons	1,487	1,513	1,535	r 1,619	1,894
Diamond:					
Gem...carats	13,524	60,495	93,971	38,400	r 57,467
Industrial...do	46,378	68,413	75,867	27,597	r 48,816
Bort...do	10,964	5,268	6,655	3,676	r 9,321
Total...do	70,866	134,176	176,493	69,673	r 115,604
Gypsum:					
For cement manufacture e	52,100	53,000	52,900	54,500	66,300
For other uses	5,880	7,033	9,936	9,967	e 10,000
Total e	58,000	60,000	63,000	64,500	r 76,300
Lime	39,449	34,706	44,764	47,940	e 70,000
Limestone:					
For cement e	1,933,000	1,967,000	1,963,000	2,028,000	2,462,000
For lime, agriculture and construction e	40,000	56,000	25,000	43,000	45,000
Total e	1,973,000	2,023,000	1,988,000	2,071,000	2,507,000
Salt...thousand tons	59	133	145	e 176	e 200
Mineral fuels:					
Coal, bituminous...do	35	31	27	42	36
Gas, natural:					
Usable production:					
Sold...million cubic feet	62,922	66,467	76,207	83,933	87,049
Producers' fuel and losses...do	108,974	116,065	117,409	125,432	130,909
Transformed into products...do	18,138	17,652	20,638	20,825	19,458
Injected for repressuring...do	412,871	487,250	511,470	607,122	598,219
Subtotal...do	602,905	687,434	725,724	837,312	835,635
Flared...do	574,952	548,791	629,029	560,882	551,146
Total...do	1,177,857	1,236,225	1,354,753	1,398,194	1,386,781
Natural gas liquids:					
Natural gasoline...thousand 42-gallon barrels	3,919	2,349	3,348	3,251	2,500
Liquid petroleum gas...do	3,309	5,764	4,758	5,088	1,649
Total...do	7,228	8,113	8,106	8,339	4,149
Petroleum:					
Crude...do	1,041,675	1,065,757	1,167,910	1,185,511	1,241,782
Refinery products:[1]					
Gasoline and naphthas...do	38,840	42,580	48,578	50,795	47,693
Kerosine...do	9,382	10,847	10,182	8,849	11,716
Distillate fuel oil:					
Diesel oil...do	43,525	43,169	48,917	54,757	48,316
Gas oil...do	13,572	20,511	26,238	24,857	29,392
Residual fuel oil...do	187,470	188,260	212,282	214,573	233,951
Lubricating oil...do	1,473	3,688	4,054	4,402	4,638
Refinery gas...do	4,532	4,581	4,541	4,607	4,522
Asphalt...do	6,334	6,548	6,727	5,275	5,443
Other...do	18,016	19,203	13,755	12,663	14,949
Total...do	323,144	339,387	375,274	380,778	400,620
Adjustments[2]...do	229	658	986	473	960
Total refinery throughput...do	322,915	338,729	374,288	380,306	399,660

r Revised. e Estimate. NA Not available.

[1] All data for 1960–64 are revised.

[2] As reported in source; all figures are negative and allow for specific gravity changes resulting from processing.

Source: Ministerio de Minas e Hidrocarburos, Venezuela. Memoria 1964.

TRADE

Venezuela's total exports in 1963 amounted to 8,807 million bolívares (Bs) and its imports totaled Bs 3,703 million, resulting in a favorable trade balance of Bs 5,104 million. Value of the country's mineral exports for the same year was Bs 8,583 million and that for mineral imports amounted to only Bs 383 million, indicating an even more favorable trade balance of Bs 8,200 million. This balance of trade was just slightly higher than the 1962 balance.

Converting the above figures at Bs 3.09 equal to US$1.00 (the exchange rate used in the country's trade statistics even though the 1963 free exchange rate was Bs 4.54 to US$1.00) showed that mineral exports, imports, and balance of trade were $2,778 million, $124 million, and $2,654 million, respectively. Total Venezuelan trade advantage for 1963, however, was $1,652 million resulting from $2,850 million worth of exports and $1,198 million worth of imports. Venezuela's chief mineral exports in 1963 were petroleum and iron ore, values of which were $2,639 million and $107 million, respectively. These two commodities together comprised 97 percent of Venezuela's total value of exports in 1963. Mineral commodity imports during 1963 consisted mostly of semimanufactured metal (iron and steel) goods valued at $106 million, 85 percent of the total value of mineral imports. Other mineral imports during the year were nonmetals valued at $10 million; solid fuels (mostly coke), $2 million; and refined petroleum products (mostly lubricating oil and gasoline additives), $6 million.

TABLE 2.—Venezuela: Value of metal and mineral trade by major commodity groups

(Thousand dollars)

Commodity group	Exports		Imports	
	1962	1963	1962	1963
Minerals:				
Metals	94,531	132,927	72,049	105,473
Nonmetals	5,640	5,410	4,020	10,185
Solid fuels	-----	-----	110	2,356
Petroleum and derivatives	[r] 2,607,760	2,639,208	6,826	6,046
Total	[r] 2,707,931	2,777,545	83,005	124,060
All other commodities	[r] 103,826	72,553	[r] 768,527	1,074,407
Total trade	[r] 2,811,757	2,850,098	[r] 851,532	1,198,467

[r] Revised.

TABLE 3.—Venezuela: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Iron and steel:			
Iron ore .... thousand tons..	13,285	12,319	United States 9,312; United Kingdom 1,365; West Germany 1,006.
Cast iron	74,481	89,733	Japan 88,591; Colombia 1,142.
Steel ingots and equivalent primary forms.	5,000	133,605	Italy 73,699; Japan 31,294; Spain 9,640.
Seamless tubes	758	5,277	United States 5,117; Belgium-Luxembourg 160.
Nonferrous base metals, unwrought and semimanufactures thereof, not further described.	16,209	5,924	United States 4,673; United Kingdom 710; Netherlands 403.
Nonmetals:			
Cement, white	171,406	185,882	Surinam 45,298; Costa Rica 30,500; Spain 27,553.
Diamond .... thousand carats..	260	90	United States 35; United Kingdom 30; Bermuda 15.
Earths and clays, not further described.	88	----------	
Granite	45	----------	
Gypsum, crude	----------	5,660	All to Trinidad and Tobago.
Sand, all types	280	45	All to Colombia.
Stones, not further described	2	----------	
Other nonmetals, not further described.	1	162	Costa Rica 105; Puerto Rico 25; Colombia 20.
Mineral fuels:			
Petroleum:			
Crude..thousand 42-gallon barrels..	[r] 810,485	818,326	Netherlands Antilles 264,824; United States 181,259; Canada 88,374.
Refinery products:			
Gasoline .... do....	[r] 12,817	21,299	United States 6,435; Netherlands Antilles 4,670; United Kingdom 1,924; Puerto Rico 1,755.
Kerosine .... do....	[r] 3,479	1,388	Netherlands Antilles 368; United States 262; United Kingdom 119; El Salvador 83.
Distillate fuel oil .... do....	[r] 56,299	61,060	United Kingdom 12,577; Netherlands 10,677; United States 5,307; Canada 4,495.
Residual fuel oil .... do....	[r] 191,014	202,717	United States 120,587; Netherlands Antilles 25,120; United Kingdom 19,668.
Lubricants .... do....	[r] 6	7	All to Brazil.
Asphalt .... do....	[r] 5,146	3,420	United States 3,026; Dominican Republic 135.
Other .... do....	[r] 17,511	13,626	United States 7,606; United Kingdom 1,062; Spain 618; Belgium-Luxembourg 481.
Total .... do....	[r] 286,272	303,517	
Natural gas products:			
Natural gasoline thousand 42-gallon barrels..	[r] 795	1,483	United States 794; Netherlands Antilles 689.
Liquefied petroleum gas ...... do....	[r] 2,623	3,193	Brazil 2,228; Netherlands Antilles 404; Panama 298.
Total	[r] 3,418	4,676	Brazil 2,228; Netherlands Antilles 1,093; United States 907.

[r] Revised.

Source: Dirección General de Estadística y Censos Nacionales, Ministerio de Fomento. Boletín de Comercio Exterior, 1962 and 1963, Venezuela.

TABLE 4.—Venezuela: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys:			
Unwrought	1,035	868	United States 461; Canada 407.
Semimanufactures	6,027	5,872	United States 1,937; Belgium-Luxembourg 1,884; United Kingdom 1,241.
Antimony, all forms	11	17	All from Canada.
Chromite	51	121	All from United States.
Copper and alloys:			
Unwrought	22	92	United States 84.
Semimanufactures	5,117	5,948	United States 3,087, Canada 1,704; West Germany 461.
Iron and steel:			
Iron ore and concentrate	(1)	(1)	Mostly from United States and France.
Scrap	11,177	19,264	All from United States.
Pig iron	753	6,457	United States 5,741; Mexico 698.
Ferroalloys	4,624	2,005	United States 906; West Germany 368; Canada 337.
Steel:			
Ingots and equivalent forms	43,919	6,608	West Germany 5,476; Mexico 629; United States 189.
Semimanufactures:			
Bars, rounds and structural sections.	69,086	50,036	Belgium-Luxembourg 24,445; West Germany 9,869; France 2,696.
Plates and sheets:			
Uncoated	46,002	57,289	Belgium-Luxembourg 16,853; West Germany 13,450; France 12,020.
Coated:			
Tinplate	64,932	53,776	France 23,305; Canada 10,186; Japan 7,824.
Galvanized and other.	22,947	22,037	Belgium-Luxembourg 9,021; Japan 6,121; United States 4,009.
Hoop and strip	1,000	770	United States 512; West Germany 121; Belgium-Luxembourg 62.
Wire	29,013	32,352	Belgium-Luxembourg 11,891; West Germany 9,962; France 3,152; Argentina 3,000.
Pipe and fittings	120,396	166,764	United States 101,901; Japan 15,601; West Germany 10,004; United Kingdom 9,904.
Rails and accessories	1,917	3,993	United States 2,334; Brazil 1,323.
Various semimanufactures reported as plated with precious metals.	4,297	2,614	United States 2,560.
Other	1,154	1,273	United States 429; Netherlands 354; Belgium-Luxembourg 181.
Lead:			
Unwrought, including argentiferous lead, antifriction metal, and type metal alloys.	1,885	3,264	Mexico 1,123; United States 1,063.
Semimanufactures, including those of alloys.	274	202	United States 79; West Germany 31; Belgium-Luxembourg 25; Netherlands 25.
Mercury 76-pound flasks	135	413	Italy 282; Mexico 70; West Germany 25; United States 19.
Nickel and alloys, all forms	41	61	United States 41; Canada 11.
Platinum group metals and their alloys, unworked and semimanufactures. troy ounces	13,310	36,523	United States 35,044.
Silver and alloys:			
Unwrought troy ounces	206,729	371,052	West Germany 347,389; United Kingdom 12,571; United States 4,951.
Semimanufactures do	469,401	103,815	United Kingdom 38,485; United States 34,369; West Germany 28,839.
Tin and its alloys:			
Unwrought long tons	215	222	Denmark 109; United Kingdom 74; United States 20.
Semimanufactures do	22	22	United Kingdom 9; United States 9.
Zinc and alloys:			
Unworked	179	306	Belgium-Luxembourg 163; United States 82; Canada 41.
Semimanufactures	579	432	West Germany 247; Belgium-Luxembourg 109.

See footnotes at end of table.

TABLE 4.—Venezuela: Imports of metal and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Nonferrous metals, various semimanufactures reported as plated with precious metals.	158	35	West Germany 14; Italy 8; Mexico 7.
Nonferrous metals, not otherwise described:			
Ores, concentrates, and scrap	[r] 3,578	2,116	Norway 1,081; British Guiana 508; United States 415.
Metal:			
Unwrought	1	107	Switzerland 101.
Semimanufactures, other	18	423	Australia 407.
Nonmetals:			
Abrasives	315	255	United States 95; Italy 79; West Germany 72.
Asbestos, crude, washed or ground	3,452	2,626	Canada 2,069.
Barite	3,556	54	Canada 36.
Bentonite	4,158	2,829	United States 2,765.
Borates	388	542	Belgium-Luxembourg 368; United States 109.
China clay	6,407	4,144	United States 3,292.
Cryolite	1	1	All from West Germany.
Diamond, industrial [2] thousand carats	2,840	7,555	Territory of Papua 7,500.
Diatomaceous earth	2,775	1,962	United States 1,866.
Feldspar	6,596	5,006	United States 4,982.
Fertilizers and fertilizer materials:			
Nitrogenous	[r] 20,024	18,902	Netherlands 5,850; West Germany 5,021; Belgium-Luxembourg 4,200.
Phosphatic	4,183	5,790	United States 3,409.
Potassic	8,262	6,986	Italy 4,208; West Germany 1,511; United States 1,127.
Mixed	29,812	20,975	West Germany 11,985; Netherlands 3,636; United States 2,737; Italy 2,578.
Fluorspar	550	388	United States 327.
Fuller's earth	509	446	United States 289.
Graphite	145	89	United States 54.
Gypsum, crude and calcined	37	54	United States 37.
Magnesite	766	645	United States 336; Netherlands 257.
Mica	333	142	United States 139.
Refractory earths and rocks, not further described.	1,974	1,864	British Guiana 1,200.
Sand	2,146	2,671	United States 2,530.
Stone, industrial, not further described	3,194	8,641	United States 8,608.
Sulfur:			
Unrefined	10,028	9,883	Mexico 5,000; United States 4,876.
Refined	529	566	United States 408.
Talc	1,769	1,945	Italy 847; United States 582; Norway 304.
Vermiculite	58	284	United States 237; Canada 47.
Mineral fuels:			
Briquets of coal and coke	103	148	All from United States.
Carbon black	4,422	1,072	United States 986.
Coal	3,140	14,940	United States 14,934.
Coke	124,937	126,900	United Kingdom 102,212; United States 23,639.
Crude oil and partly refined products	17	10	All from United States.
Natural bitumen	101	180	United States 138.
Petroleum refinery products:			
Gasoline, kerosine, and gas-diesel oil	87	85	Netherlands 63.
Gasoline additives	12,275	3,127	United States 2,413; United Kingdom 684.
Lubricants	20,026	8,411	United States 7,119.
Solvents	437	870	United States 710.
Other	8,521	9,099	United States 8,671.

[r] Revised.
[1] Less than ½ unit.
[2] Approximate, based on data reported in kilograms.

Source: Dirección General de Estadística y Censos Nacionales, Ministerio de Fomento. Boletín de Comercio Exterior, 1962 and 1963, Venezuela.

COMMODITY REVIEW

METALS

Aluminum.—An official of Corporación Venezolana de Guayana (Venezuelan Guayana Corp.—CVG) in October 1964 reported construction of an aluminum plant on the Caroní River in the Guayana area would start soon. The aluminum installation had been the subject of negotiation between CVG and Reynolds Metals Co., for the last 3 years. The most recent proposal would utilize a newly developed process for extracting aluminum from native ore.

Gold.—Despite an accident in the latter part of 1964 in the hoisting tower of the Sosa Méndez mine, resulting in a temporary reduction of ore feed to the treating plant, gold production at the mine in 1964 was 6,600 troy ounces or 25 percent above the 1963 level. Venezuela's gold consumption in 1964 was approximately 260,000 ounces, which resulted in a deficit of 230,000 ounces compared to total output. Approximately 91 percent of the gold was consumed by the country's jewelry industry and the remainder for dentistry and minting of special coins.

Recognizing this large deficit, Minas de Oro de El Callao, C.A. (MOCCA), a Government-operated firm and the principal gold producer in Venezuela, planned to modernize its equipment and expand its operations to bring the level of annual output to 64,000 ounces, an amount more than double its 1964 operating capacity. To provide sufficient ore for the expected new installations, an exploratory drilling program was initiated in 1964 to determine the ore grade in the new deposits in the area.

Iron Ore.—There was a striking recovery in the Venezuelan iron ore industry in 1964, with production reversing the downward trend of past years and falling only 3.8 million tons short of the 1960 peak. The industry's gross earnings in 1964 totaled $100 million compared with $63 million in the preceding year. Net earnings for the year amounted to $28.3 million, $16.1 million above the 1963 figure. The increase in net earnings was achieved mainly by increased efficiency which lowered the cost of production by $0.50 per ton although other production costs, operating expenses, and taxes were proportionately higher in 1964 than the year before.

Domestic sales of iron ore in 1964 totaled 571,260 tons to the División Siderúrgica del Orinoco (Matanzas steel plant) and 2,963 tons to C.A. Venezolana de Cementos. The increase in domestic sales during 1964, 131,232 tons or 30 percent above the 1963 sales, was chiefly due to larger purchases by Matanzas, which brought 140,282 tons more in 1964 than in 1963, while C.A. Venezolana's 1964 purchases were 8,670 tons below the firm's 1963 amount. Foreign sales totaled 2.5 million tons in 1964, a gain of 21 percent over 1963. Increases in exports were mainly due to heightened demand by the United States and West Germany, who each increased purchases by more than 1 million tons in 1964 over those in the preceding year. Of total sales, approximately 96 percent was exported and 4 percent was sold in the domestic market.

Foreign sales of iron ore have been a large contributor to Venezuela's trade balance. The fall of iron ore prices during 1963 and 1964, an aggregate of $1.24 per ton for the 2 years, became a deep concern of the Venezuelan Government. The calculated loss of income for the 2 years amounted to about $34 million. Moreover, prices of various steel products, of which the country was a sizable importer, had steadily risen. The Ministry of Mines and Hydrocarbons, in hopes of stabilizing the iron ore market, passed a resolution in December 1964 creating the Coordinating Commission for the Conservation and

Marketing of Iron Ore. One of the provisions of the resolution stipulated that the companies engaged in iron ore activities must submit to the newly created commission their production schedules and sales programs indicating the corresponding prices. Statistical details on production, domestic sales, and trade of iron ore by company were as follows:

	Metric tons		
	1962	1963	1964
Orinoco Mining Co.:			
Production	10,532,113	[r] 10,040,305	13,675,884
Sold in Venezuela	81,777	334,323	453,125
Exported to:			
United States	7,499,819	7,051,193	8,386,567
West Germany	1,069,054	1,044,117	2,149,468
United Kingdom	1,196,307	1,383,746	1,685,785
Italy	667,980	597,439	885,294
Netherlands	----------	----------	34,542
Total	10,433,160	10,076,495	13,141,656
Iron Mines Company of Venezuela:			
Production	2,733,767	1,706,747	1,980,437
Sold in Venezuela	429,941	108,668	121,098
Exported to United States	2,876,632	2,277,206	1,751,743
Total:			
Production	13,265,880	[r] 11,747,052	15,656,321
Sold in Venezuela	511,718	442,991	574,223
Exported	13,309,792	12,353,701	14,893,399
Total sales	13,821,510	12,796,692	15,467,622

[r] Revised.

Source: República de Venezuela—Ministerio de Minas e Hidrocarburos. Carta Semanal (English Translation). No. 8, Feb. 20, 1965, 17 pp.; No. 9, Feb. 27, 1965, 17 pp.

Venezuela's iron ore concessions in force at yearend 1964 totaled 29,000 hectares, 250 hectares less than at yearend 1963. The table below gives the names of firms and their respective areas and percent of total distribution.

Name of firm	Concessions in force Dec. 31, 1964 (hectares)	Percent distribution
Venezuelan Atlantic Refining Co	10,000	34.90
Iron Mines Co. of Venezuela	8,600	30.02
Orinoco Mining Co	8,093	28.26
Oswaldo de Sola	1,751	6.12
Fred Goetsch	200	.70
Total	28,644	100.00

The only concessions mined were some held by Orinoco Mining Co. (subsidiary of U.S. Steel Corp.) and Iron Mines Co. of Venezuela (subsidiary of Bethlehem Steel Corp.). At yearend 1964, about 4,800 hectares or 17 percent of the total had been extensively mined. Over 90 percent of the area under concession is in the Imataca Formation, especially in the Bolívar quadrangle where the country's richest iron ore deposits are located. Proven reserves in the concessions granted to various firms at yearend 1964 totaled 820 million tons, a decrease of 16 million tons compared with the 1963 yearend figure. Total proven reserves of iron ore in the country, those of private companies plus those in the Government's reserves, totaled 1,497 million tons.

Iron and Steel.—Venezuela's new fully integrated steelworks, División Siderúrgica del Orinoco, Corporación Venezolana de Guayana (CVG), moved closer to completion in 1964. The Matanzas steel plant of CVG is wholly owned by the Venezuelan Government and has been under construction since 1957, being built by the Italian firm, Innocenti, S.G. The plant is on the south bend of the Orinoco River, about 18 kilometers west of the confluence with the Caroní River, at the city of Puerto Ordaz. In the spring of 1961, when trial operations went into effect, CVG entered into a management contract with Koppers Co. Since that time construction has been under the supervision of that company. This steelworks, upon completion, will rank second in size in South America to the Volta Redonda plant in Brazil. The Matanzas plant utilizes the following important elements which Venezuela can supply as well as, if not better than, any other country in the world: High-grade iron ore from nearby mines, cheap and abundant hydroelectric power, and immediate availability of ocean-going transportation.

After improvements were made in various production facilities following trial operations, CVG stepped up production. In 1964, steel production more than doubled the 1963 output. When production reaches 700,000 of 800,000 tons within a year or so, the steelworks will not only offer significant employment opportunities to the local population but will also provide for all the major domestic needs for basic steel products.

In late 1964, Venezuela's first galvanized sheet metal plant, owned by Lamigal S.R.L., went into full production. The Valencia-based plant, a joint venture of Venezuelan and Japanese interests, has an annual capacity of 24,000 tons and is able to supply over 95 percent of the more commonly used sizes of galvanized plates. These materials have been purchased from Japan in the past year. It has planned to purchase its steel requirements from the Matanzas plant when it begins plate rolling.

Nickel.—On November 4, 1964, Venezuela's supreme court (Political-Administrative Tribunal) ruled in favor of the Ministry of Mines and Hydrocarbons for terminating some 18,500 hectares of nickel mining concessions in the States of Aragua and Miranda leased by Compañía Meridional de Minas, S.A., an affiliate of Nickel of Canada, Ltd. The reason given for the action was that the company was only simulating the exploitation of the leased area and really never initiated the construction of installations and buildings required for true commercial mining activities, and that this failure did not satisfy the national interest concerning the development of the mining industry.

NONMETALS

Asbestos.—Beginning in late 1963, a general geological survey was made of the Tinaguillo Municipality in the State of Cojedes to determine the existence of asbestos in the various areas of La Montañita, El Tigre, Casupito, and La Manguera. Encouraging preliminary findings in 1964 have prompted thorough investigations of the areas to determine exactly the size of the deposits and the quality of the fibers.

Cement.—The Venezuelan cement industry has become a mature industry inasmuch as its capacity, estimated at 2.5 to 3 million tons a year in 1964, has been more than ample to meet domestic needs and no expansion is anticipated in the immediate future. Cement capacity was built up rapidly during the 1950's to meet the growing demands of the country's construction industry, which used far greater quantities of cement per building than was the case in most areas of the United States. The relatively high cost of steel and building brick, in addition to the fact that wood deteriorates rapidly as a result of climate and termites, all contribute to preference for cement. Before the buildup of its cement industry, Venezuela had been traditionally a cement importing country. By 1964, C.A. Venezolana de Cementos had built up sufficient capacity alone to produce enough white cement to meet national requirements. That amount above domestic needs has been exported, generally to the Caribbean. Although the cement industry had been operating at about 50- to 60-percent capacity throughout 1964, the future of the industry appears bright since the population is expanding rapidly, there is a large housing demand, and the various public works and hydroelectric projects are likely to add greatly to demand.

Caustic Soda and Fertilizers.—The director-general of the Government's petrochemical plant announced in late 1964 that present installations for manufacturing chlorine, caustic soda, and fertilizers will be doubled in the near future. Present capacity of the plant is 30 tons per day of chlorine and caustic soda and 480 tons per day of nitrogenous fertilizers. Part of its production has been exported to earn about $4 million annually.

Diamond.—Venezuela's 1964 diamond production increased by 46,000 carats of 66 percent above the 1963 amount. Both gem and industrial types showed increases over production in the previous year. The biggest gain was in bort production, which was nearly 6,000 carats more than in 1963 or an increase of about 154 percent. The entire Venezuelan diamond production in 1964 came from the sands of the Paragua River and its tributaries. The 1964 increase was due to the discovery of a diamond-bearing packet in the El Merey zone in the State of Bolívar. However, this newly discovered area was exploited to depletion during the year.

Phosphorus.—Geological investigations made in 1964 in the Lobatera District in the State of Tachira resulted in the discovery of a new deposit of uranite phosphorite in the El Puyón zone. Chemical analysis of the ore revealed an average content of 20 percent P_2O_5. Preliminary estimates placed the phosphorus content of the zone at 114,000 tons.

Silica and Clay.—Vidrios Templados, C.A., and Vidrios Curvos, C.A., started production of safety glass during the third quarter of 1964 in a new jointly operated plant called Vidrios Curvos de Seguridad in Soco, La Victoria, in the State of Aragua. Production was under the technical assistance of Perman Glass, Inc. The million dollar plant has been reported to be the most technically advanced in Latin America. Products of the plant include, in addition to automobile windshields, an assortment of safety glass for domestic appliances and doors.

A refractory brick plant was opened in Puerto Ordaz in early October 1964 by Ceramicas Carabobo. The new plant is located in the developing industrial area of Guayana close to the Matanzas steel plant which it will supply with refractory bricks and other high-temperature materials.

MINERAL FUELS

Coal.—In 1964 Venezuelan coal production, mostly of the volatile bituminous variety, decreased 6,000 tons or 14 percent, compared with 1963 production. Of this output, 99 percent came from the State of Tachira and the remainder from the Taguay zone in the State of Aragua. The decrease was mainly the result of suspension of operations during 1964 by C.A. Minas de Carbón de Naricual, Venezuela's second largest coal producer, as a result of the termination of smelting studies at the Strategic-Udy furnaces of the Matanzas steel plant at the end of 1963. The decrease, however, was partially offset by increased output by C.A. Minas de Carbón de Lobatera, Venezuela's largest producer. Coal production by the various producers during 1963 and 1964 was as follows:

Producer	Metric tons		Share of total in 1964 (percent)
	1963	1964	
C.A. Minas de Carbón de Lobatera	24,378	30,234	83.17
Minas de Carbón de Naricual	12,342		
C.A. Cementos Tachira	1,255	2,391	6.58
Ponciano Ruiz	1,435	1,298	3.57
G. Omaña	1,262	986	2.71
Carbonera Taguay		173	0.48
Others	1,676	1,269	3.49
Total	42,348	36,351	100.00

Source: Ministerio de Minas e Hidrocarburos, Venezuela. Carta Semanal, v. VIII, No. 22, May 29, 1965, pp. 15–16.

Petroleum.—World production of crude petroleum in 1964 was about 28 million barrels per day, of which Venezuela accounted for about 12 percent or 3.4 million barrels, ranking it third behind the United States and the U.S.S.R. among world crude oil producers. Up to 1959, Venezuela was second in world crude petroleum output.

Venezuela had an overall 4-percent increase in crude oil production in 1964 compared with the 1963 output. This increase, however, was not achieved until late in the year when increased demand during the winter months had a significant effect. Thus, the highest production was achieved in December and the lowest occurred in April. The companies that accounted for the increase were Cía. Shell de Venezuela, Ltd., Venezuelan Sun Oil Co., Mobil Oil Co. of Venezuela, Texas Petroleum Co. (Texaco), Coro Petroleum Co., and the Government-owned Corporación Venezolana del Petróleo (CVP), for a total increase of 190,000 barrels per day over the 1963 production rate. Of these companies, Texaco (formerly Superior Oil Co.) increased crude output 63 percent above its 1963 level, while CVP doubled its daily output in 1964. Other firms, however, recorded an overall decrease of 45,300 barrels per day, compared with the preceding year. Mene Grande Oil Co., Richmond Exploration Co., Phillips Petroleum Co., San Jacinto Venezolano C.A., and Signal Oil & Gas of Venezuela, however, increased their output greatly during the last 2 months in 1964.

TABLE 5.—Venezuela: Distribution of petroleum production, exports, refinery feed, and landholdings by companies, 1964

Company	Parent company		Quantity (thousand 42-gallon barrels)				Concessions[1] and assignations[2] as of Dec. 31, 1964 (hectares)		
	Name	Nationality	Crude production	Crude exports	Product exports	Refinery throughput	Eastern[3]	Western[4]	Total
Private:									
Creole Petroleum Corp.	Standard Oil Co. (N.J.)	United States	478,230	330,764	130,811	159,750	432,063	294,731	726,794
Cía. Shell de Venezuela, Ltd.	Royal Dutch-Shell Group	British and Netherlands	344,553	261,138	93,665	131,504	25,500	448,077	473,577
Mene Grande Oil Co.	Gulf Oil Corp.	United States	147,340	46,492	36,001	40,503	726,016	123,163	849,179
Venezuelan Sun Oil Co.	Sun Oil Co.	do.	77,211	69,515	1,883	2,412	---	20,000	20,000
Mobil Oil Co. of Venezuela	Socony Mobil Oil Co.	do.	50,310	29,367	17,787	22,787	159,654	73,829	233,483
Richmond Exploration Co.	Standard Oil Co. of California	do.	19,164	13,560	5,996	8,688	---	135,158	135,158
Texas Petroleum Co.	Texaco Inc.	do.	27,405	13,464	17,133	17,373	70,878	14,099	84,977
Phillips Petroleum Co.	Phillips Petroleum Co.	do.	23,786	21,753	---	1,310	71,043	18,560	89,603
Sinclair Venezuelan Oil Co.	Sinclair Oil Corp.	do.	19,560	8,833	10,090	12,175	120,654	101,597	222,251
Superior Oil Co. of Venezuela[5]	Superior Oil Co. of California	do.	---	14,864	---	---	---	---	---
Texaco—Maracaibo	Texaco Inc.	do.	25,902	11,168	---	---	---	3,147	3,147
Venezuelan Atlantic Refining Co.	Atlantic Refining Co.	do.	6,667	1,648	2,056	2,215	152,296	11,277	163,573
San Jacinto Venezolano, C.A.	San Jacinto Petroleum Corp.	do.	6,123	5,471	---	---	---	797	797
Signal Oil and Gas of Venezuela	Signal Oil and Gas Co.	do.	5,313	4,797	---	---	---	9,175	9,175
S.A. Petrolera Las Mercedes	Texaco, Inc.-Ultramar	United States and British.	3,055	---	---	---	67,537	---	67,537
Coro Petroleum Co.	Texaco Inc.	United States	2,622	2,254	---	---	33,752	800	34,552
Caracas Petroleum, S.A.	Ultramar Co., Ltd.	British	1,909	3,026	---	---	41,722	14,167	55,889
Talon Petroleum, C.A.	Kirby Petroleum Co.	United States	282	435	---	---	---	2,075	2,075
International Petroleum Co.	Standard Oil Co. (N.J.)	do.	---	21,514	---	---	4,633	1,500	6,133
Continental Oil Co. of Venezuela	Continental Oil Co.	do.	---	---	---	---	36,786	---	36,786
Cía. Española de Petróleos, S.A.	Cía. Española de Petróleos	Spanish	---	---	---	---	7,728	2,818	10,546
Pan American Venezuela Oil Co.	Standard Oil Co. (Indiana)	United States	---	---	---	---	5,500	---	5,500
Pancoastal Petroleum Co.	---	do.	---	---	---	---	5,000	---	5,000
King Mill Oil Co.	King Mill Oil Co.	do.	---	---	---	---	---	4,970	4,970
Adela de Martin	[6]	Venezuelan	---	---	---	---	2,187	---	2,187
Venezuelan American Independent	Venezuelan American	United States	---	---	---	---	---	841	841
Total private companies	---	---	1,239,432	860,063	315,422	398,717	1,962,949	1,280,781	3,243,730
Venezuelan Government: Corporación Venezolana del Petróleo	---	---	2,350	---	---	944	30,980	240,989	271,969
Grand total	---	---	1,241,782	860,063	315,422	399,661	1,993,929	1,521,770	3,515,699

[1] To private companies.
[2] To the Government.
[3] States of Guárico, Anzoátegui, Monagas, and Sucre, and Territory of Delta Amacuro.
[4] States of Barinas, Zulia, Trujillo, Merida, and Falcón.
[5] Formerly Superior Oil Co. of California.
[6] Individual owner.

Source: Oficina Tecnica de Hidrocarburos, Ministerio de Minas e Hidrocarburos Caracas. Informe sobre las Actividades, 1964. 1965, pp. IV-95.

During the latter part of 1964, Signal discovered a new oil reservoir in the Centro field. Preliminary results obtained from the drilling showed promise of a significant discovery, indicating that the Centro area might contain sizable amounts of petroleum, contrary to earlier opinions.

At the end of the third quarter of 1964, a total of 437 wells had been drilled in Venezuela during the year, compared with 368 wells drilled during the same period in 1963, an increase of 19 percent. Most of this increased drilling, done largely by Shell, occurred in the Maracaibo area. Wells drilled in the Maturin District totaled 38 during the first three-quarters of 1964, 21 more than 1963. Drillings in the Barcelona District, however, decreased from 116 wells in 1963 to 96 in 1964 during the same period. Total number of wells drilled for 1964 has been estimated at 580, compared with 498 in the previous year, an increase of 17 percent.

Venezuela's proven petroleum reserve at yearend 1964 was estimated at 17,200 million barrels. New 1964 findings added a net 239 million barrels to the 1963 yearend proven reserve of 17,000 million barrels.

SOURCE MATERIALS

Basic information on the mineral industry of Venezuela was derived from publications of the Ministry of Mines and Hydrocarbons (Ministerio de Minas e Hidrocarburos), including its Annual Report (Memoria) for 1963 and 1964, its Account of Activities (Informe sobre las Actividades) for 1963 and 1964, and various issues of its Weekly Letter (Carta Semanal). All foreign trade data, except petroleum, were obtained from the Bulletin of External Trade (Boletín de Comercio Exterior) for 1962 and 1963, published by the General Bureau of Statistics and National Census of the Ministry of Development (Dirección General de Estadística y Censos Nacionales, Ministerio de Fomento). Statistics on petroleum foreign trade are from publications of the Ministry of Mines and Hydrocarbons.

The Mineral Industry of Other South American Areas

By Garn A. Rynearson and Bernadette Michalski

Contents

Page
Ecuador 301
French Guiana 305
Paraguay 310
Uruguay 315

ECUADOR[1]

ECUADOR'S principal mineral products, cement and crude petroleum, registered increases of 11 and 13 percent, respectively, compared with 1963. These products accounted for 85 percent of the total 1964 mineral output value, which was estimated at about $11 million.[2] Mineral output value increased only 10 percent over that of the previous year as a result of decreased output of copper, gold, kaolin, lead, and silver.

Ecuador made no significant contribution to the world supply of any mineral, and the mineral industry contributed only slightly more than 1 percent to the gross national product (GNP). Less than 1 percent of the Ecuadoran labor force of 2.2 million was employed in the mineral industry.

GOVERNMENT POLICIES AND PROGRAMS

In March of 1964 a 10-year mining program was launched with an estimated investment cost of US$4.5 million. Areas slated for concentrated exploration and development were the southern coal basins, the Portovelo and Esmeraldas gold districts, the Riobamba and Cuenca kaolin areas, and the Guayas province iron ores.

At yearend the Ecuadoran labor code reform was in effect. In addition to improvements in general working conditions, the code required employers to increase the distribution of profits to employees from 7 to 10 percent.

---

[1] Prepared by Bernadette Michalski, commodity research assistant, Division of International Activities.

[2] Where necessary, values have been converted from sucres (S) at the rate of S18 equals US$1.00.

PRODUCTION

The 13-percent upturn in crude oil production in 1964, based at least in part on successful new well completions, was the first increase reported since output in 1961 topped that of 1960. Production, however, still was 4 percent below the level set in 1961 and 22 percent below the record peak reached in 1955. The increase in petroleum refinery production to a new high more than matched the crude oil output increase on a volume basis, although on a percentage basis, refinery production increased only 11 percent over that of 1963. The refinery production increase reflected Ecuador's growing dependence upon imported crude oil relative to domestic crude output; despite the 1964 crude oil output increase, the difference between domestic crude production and refinery runs to stills was larger in 1964 than in any year since 1959.

Declining lead concentrate and gold output in contrast to slightly increasing zinc and cadmium concentrate recovery apparently reflected changes in ore composition at depth in the Zaruma area mines of El Oro province, which were presumed to be the only operating nonferrous metal mines in Ecuador.

TABLE 1.—Ecuador: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals					
Cadmium, in zinc concentrates ... kilograms			931	2,008	2,141
Copper, in concentrates	100	101	158	284	184
Gold, in concentrates ... troy ounces	15,209	15,210	20,591	21,041	16,905
Lead, in concentrates	108	111	124	164	140
Silver ... troy ounces	126,419	101,190	127,739	121,784	117,126
Zinc, in concentrates		112	164	358	380
Nonmetals:					
Cement	200,812	219,165	214,220	258,394	287,806
Clay, kaolin	317	545	377	352	208
Gypsum	83	81	32	NA	NA
Ocher	4	2	2	1	NA
Salt	[r] 29,670	[r] 31,500	[r] 32,000	[e] 35,000	[e] 35,000
Sulfur	107	112	NA	203	NA
Mineral fuels:					
Lignite	396	250	99	65	35
Petroleum: Crude ... thousand 42-gallon barrels	2,730	2,926	2,573	2,465	2,796
Refinery products:					
Gasoline ... do	1,730	1,399	1,467	1,811	2,123
Kerosine and jet fuel ... do	300	319	321	437	478
Distillate fuel oil ... do	693	748	698	813	859
Residual fuel oil ... do	1,206	1,490	1,218	1,167	1,296
Other ... do	202	219	201	67	42
Total ... do	4,131	4,175	3,905	4,295	4,798

[e] Estimate. [r] Revised. NA Not available.

TRADE

Ecuador's overall foreign trade balance dropped by US$21 million in 1964. A slight decline in exports coupled with an increase of 14 percent in imports ended the favorable balance of trade enjoyed by Ecuador for the last decade.

During 1963 mineral exports contributed 1 percent to the total export by value. Metals and minerals accounted for 19 percent of imports.

TABLE 2.—Ecuador: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Bauxite	----------	1	All to the United States.
Copper:			
Crude, matte, residue, scrap	3	----------	
Bars, shapes, wire	2	----------	
Gold and its alloys, crude and in dust. troy ounces	20,591	----------	
Iron and steel scrap	875	283	Japan 250; United States 33.
Lead concentrates	508	760	All to West Germany.
Zinc concentrates	372	967	Mainly to France.
Calaverite	----------	5	All to the United States.
Nonmetals:			
Salt	25	----------	
Mineral fuels:			
Petroleum, crude thousand 42-gallon barrels	175	185	All to Argentina.

TABLE 3.—Ecuador: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum bars, sheets, foil, pipes, tubes, and wire.	278	512	Austria 231; West Germany 100; United States 91; Italy 36; Hong Kong 25.
Copper bars, slabs, forgings, sheets, foil, wire, pipe, tubes, and solder.	242	364	Chile 117; Mexico 115; West Germany 44; United States 25; Canada 14.
Gold, crude, sheets and powder troy ounces	289	225	All from West Germany.
Iron and steel:			
Pig iron	70	20	All from West Germany.
Ferroalloys	2	2	All from United Kingdom.
Ingot castings and equivalent forms.	22	(1)	Mainly from the United States.
Semimanufactures:			
Bars, beams and sections	r 16,689	23,657	Belgium 17,812; France 2,830; West Germany 2,667.
Sheets and plates:			
Plain	4,265	7,358	Belgium 5,420; West Germany 852; France 435; United States 225.
Galvanized and enameled.	541	1,506	Belgium 900; France 225; Japan 215.
Tinplate	2,208	2,262	United States 1,006; Canada 971.
Hoops or straps	r 168	233	Belgium 143; West Germany 45; United States 23.
Wire	r 4,099	6,921	Belgium 2,236; France 1,568; Czechoslovakia 1,271; West Germany 693; Netherlands 532.
Pipe and pipe fittings	5,793	4,600	West Germany 1,143; France 1,065; United States 909; Belgium 645.
Rails	485	376	West Germany 328; Belgium 47.
Other	359	370	United States 320.
Total crude and mill products.	r 34,701	47,305	
Lead pieces, bars, plates, sheets, foil, pipes, tubes, fittings, etc.	209	259	United Kingdom 68; Belgium 62; Mexico 60; Peru 30.
Tin bars, pipes, tubes, foil, containers, and solder.	25	25	United Kingdom 18; United States 4.
Zinc slabs, bars, plates, sheets, pipes, tubes, wire, foil.	22	33	West Germany 14; United States 10; Belgium 8.

See footnotes at end of table.

TABLE 3.—Ecuador: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals:			
Abrasives, natural	18	10	West Germany 6; Netherlands 2.
Asbestos, crude, washed, or ground	390	325	Canada 308; United States 6.
Asphalt, natural	1,750	8,782	Netherlands Antilles 5,205; Venezuela 3,195.
Cement:			
Aluminous	63	40	United States 31; United Kingdom 6.
White	1,182	1.541	West Germany 607; Denmark 356; United Kingdom 286; Belgium 146.
Other	33	27	West Germany 21; United States 4.
Clays:			
Bentonite	119	127	All from the United States.
Kaolin	29	56	Mainly from the United States 14.
Other	23	42	United Kingdom 27.
Diatomite and infusorial earth	152	284	West Germany 172; United States 111.
Graphite	2	1	Mainly from the United States.
Gypsum	52	51	United States 41; West Germany 6.
Magnesite, crude or calcined	5	6	Mainly from West Germany.
Marble, alabaster, and "other forms."	121	143	Italy 119; Spain 24.
Mica, all forms	11	12	All from the United States.
Salt, common (NaCl)	70	60	Mainly from the United States.
Salts, other mineral	136	227	All from the United States.
Sand, including ground quartz	410	57	All from the United States.
Sulfur	22	88	United States 77; West Germany 9.
Talc or steatite	87	167	United States 58; Canada 49; Italy 44.
Other nonmetallic minerals, n.e.s	112	32	West Germany 20; United States 7; United Kingdom 5.
Mineral fuels:			
Coal	220	168	Mainly from West Germany.
Coal and other tars and pitches	134	119	United Kingdom 108; Chile 10.
Coke	161	338	West Germany 112; United States 101; Belgium 100.
Petroleum: Crude thousand 42-gallon barrels	----------	5,295	Venezuela 4,935.
Refinery products:			
Gasoline do	11	214	Netherlands Antilles 187; United States 17.
Kerosine do	1	3	Peru 2.
Lubricants, including greases do	37	46	United States 43.
Other do	31	34	Mainly from the United States.
Total refinery products do	80	297	

---

[r] Revised.
[1] Less than 1 metric ton.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—In a joint venture with the Compania de Aceros de Chile, a new Ecuadoran steel mill was under construction at Aloag. Ecuador was scheduled to supply 60 percent of the capital investment. The raw material and remaining investment capital will be supplied by Chile. The mill, scheduled to begin operations in 1965, reportedly will produce 26,000 tons of steel products in its first year of operation.

Nonmetals.—*Salt.*—After dissolution of the State salt-marketing monopoly in 1963, rock salt mining operations of Industrial Salinera Inversionista Dariegas S.A. reportedly were expanded in the Galapagos Islands. A new solar salt plant was under construction at yearend in San Paulo by the Salinera Ecuatorina S.A.N.E., raising the total of known solar operations to six.

Mineral Fuels.—*Petroleum.*—Petroleum exploration continued in 1964 in hope of eventual reduction in foreign exchange expenditures for petroleum. Colombian discoveries just north of the Ecuadoran border resulted in expanded exploration activities in adjacent Ecuador. The Santa Elena peninsula, however, continued to be the center of petroleum activity.

Increased petroleum output was mainly due to successful completions under an expanded drilling program in 1964. Fifty wells were drilled of which 44 yielded oil, as compared with 31 wells of which 27 yielded oil in 1963.

Anglo Ecuadoran Oilfields Ltd., accounting for 93 percent of the country's total output, reported 849 producing wells at yearend, as well as the completion of Ecuador's first commercial offshore well.

SOURCE MATERIALS

Data on the mineral industry and general economy was supplied by industrial and Ecuadoran Government sources through the U.S. Embassy at Quito. Other sources include Ministerio del Tesoro, Republica del Ecuador, Anuario de Commercio Exterior 1963, Quito, 1964; Boletin del Banco Central del Ecuador, Quito, 1965; The Engineering and Mining Journal, volume 165, No. 10, October 1964, pp. 109–118; World Oil, volume 161, No. 3, August 15, 1965, p. 106.

FRENCH GUIANA [8]

The importance of gold mining in the heavily subsidized economy of French Guiana continued to decrease as 1964 gold output amounted to only 150 kilograms (4,823 troy ounces), a little more than four-fifths that of 1963 and less than one-tenth the average annual output of the previous 100 years. Besides gold and small, unreported quantities of stone, sand and gravel, columbite-tantalite is the only mineral that has been produced on a commercial scale; however, only 1 ton of concentrate was recovered during 1964. French Guiana possesses potentially significant bauxite deposits but exploitation remained in doubt as Kaiser Aluminum and Chemical Corp. did not reveal its intentions with regard to its mining option which continues through 1965. The only significant new mineral development during the year was the grant of a concession to a French company permitting exploration for oil and gas on the Continental Shelf.

French Guiana, or Guyane Française, perhaps is best known for its gold deposits and the famous penal colony on Devil's Island which was abolished in 1948. In 1946 Guyane became a full-fledged overseas Department of metropolitan France, represented in the French Parliament by one senator and one deputy. The Department is administered locally by a prefect with the assistance of an elected 15-member council-general. It is divided into two arrondissements, the narrow coastal strip of Guyane and the almost entirely forested interior region of Inini. The total area of these two territories is approximately 90,000 square kilometers, roughly one-sixth that of continental France. The population in 1961 was about 34,000, of which nearly 19,000 lived in the capital city of Cayenne and less than 3,000 occupied the 75,000 square kilometers of Inini.

---

[8] Prepared by Garn A. Rynearson, physical scientist, Division of International Activities.

Gold has played and bauxite eventually could play a major role in the local economy; the possible discovery of petroleum would be of prime importance to the Department's development. Through 1964, however, shrimp fishing, wood products, and rum production were the major domestic sources of income. All mineral fuels and capital goods and virtually all foodstuffs and consumer goods must be imported.

GOVERNMENT POLICIES AND PROGRAMS

All mineral rights and the exploration, mining, and processing of minerals other than hydrocarbons and radioactive materials remained under the effective control of Bureau Minier Guayanais (BMG), a State corporation with an office and a relatively large research staff in Cayenne. Its purpose is to promote as well as partake in the exploration, exploitation, and all studies bearing on mineral deposits and the treatment of mineral substances. It also was empowered to administer the mining regulations of the Department and to manage the participation of other State agencies in local mineral enterprises. All exploration and mining concessions must therefore be negotiated through the Bureau, which may or may not seek to participate in a proposed enterprise on a profit-sharing basis.

French Guiana depends heavily on French state funds and public investments to counter a large imbalance between imports and exports. Most state expenditure has been for current operating expenses and support of a rather high level of educational, health, and other services made available to the populace, whereas most French public investment has been expended on improvements in port facilities, roads, and utilities.

Several large construction projects already underway or in the planning stage will require greatly increased production of locally available stone and sand and gravel as well as increased imports of cement, asphalt, and structural metals. Work began early in the year on a $2 million project, financed by the European Development Fund, to build an extension of and to improve existing parts of an all-weather paved highway between St. Laurent-du-Maroni on the Surinam border and the end of the existing paved highway between Iracoubo and Cayenne. This highway eventually will be extended from Cayenne to Oyapock on the Brazilian border. Other major construction projects will result if the proposed French missile range complex at Kourou and the Îsles du Salut is approved.

PRODUCTION AND TRADE

Data given for gold output are subject to official verification. The figures reported for 1960–62 by Annales de Mines were specified as fine gold content, whereas that for 1963 was specified as or brut or native gold. Equivalent, but unspecified, figures were reported by the Bureau de Recherches Géologiques et Minières. The 1964 figure reported by the U.S. Consulate in Martinique was specified as fine gold content. Gold export data are given by one source in terms of native gold and by another source in terms of gold content. It is assumed that both sets of data represent the same material and that both are correct.

TABLE 4.—French Guiana: Production and exports of metals and minerals

Commodity	1960	1961	1962	1963	1964
Metals:					
Columbite-tantalite:					
Production........kilograms..	....	....	....	2,282	1,000
Exports........do....	....	....	....	2,282	[1] 1,923
Gold:					
Production:					
Native gold........troy ounces..	NA	NA	NA	6,993	NA
Gold content........do....	18,940	7,944	5,273	NA	4,823
Exports:					
Native gold........do....	22,374	10,063	6,302	3,601	NA
Gold content........do....	19,313	8,649	5,369	2,636	NA
Apparent average fineness........	863	859	852	732	NA
Nonmetals: Stone, all types: Production cubic meters..	NA	NA	NA	NA	26,000

NA Not available. [1] U.S. imports.

Official trade statistics credit French Guiana with exports having a total value of approximately $664,000 for 1962, $693,000 for 1963, and $683,000 for 1964.[4] These figures include gold exports valued at $190,000 for 1962 and $77,000 for 1963 but probably do not include any gold for 1964; columbite-tantalite exports valued at about $10,300 for 1963 and $8,500 for 1964 may or may not be included in the official totals. The share of minerals in the total export market actually was smaller than the cited figures indicate because French Guiana Customs statistics exclude shrimp exports valued at about $3 million in 1963 and roughly the same amount in 1964.

TABLE 5.—French Guiana: Selected imports of metals and minerals[1]

(Metric tons)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Copper, all forms (682)........	11	19	France 18; United States 1.
Iron and steel:			
Castings and forgings, unworked (679).	972	[2] 806	France 755; Belgium-Luxembourg 32; United States 20.
Bars, rods, angles, shapes, and sections (673).	589	[2] 616	France 363; Belgium-Luxembourg 231; West Germany 23.
Nonmetals:			
Cement, lime, and fabricated building materials, except glass and clay materials (661).[3]	7,366	8,936	France 6,043; Belgium-Luxembourg 2,110; Sweden 429.
Fertilizer materials:			
Natural (271)........	102	45	All from France.
Manufactured (561)........	64	47	Do.
Inorganic chemicals: [5] Elements, oxides, and halogen salts (513).	106	403	West Indies Federation 299; France 93; Martinique 10.
Mineral fuels:			
Gas, natural and manufactured (341)	172	216	France 123; Martinique 55; West Indies Federation 38.
Petroleum products (332)........	6,574	10,865	([4]).

[1] Source reports principal imports according to the group level (3-digit code, shown in parentheses) of the Standard International Trade Classification (SITC), revised.

[2] Does not agree with total by source due to rounding.

[3] Includes 7,268 tons of portland cement for 1962 and 8,832 tons for 1963.

[4] Quantities by source not available. The West Indies Federation supplied products worth 87.6 percent; United States 10.6 percent; and France 1.1 percent of the total value of $471,000.

[5] Includes some mineral commodities normally listed under one of the three major commodity headings but not so identified by source.

Source: Foreign Trade Statistics, Associated Overseas Areas, Statistical Office of the European Communities, 1962 and 1963.

---

[4] Where necessary, values have been converted from francs (Fr) at the rate of 1 franc equals U.S. $0.20255 (U.S. $1.00=Fr 4.937).

French Guiana imported a much greater volume and variety of commodities than was exported. The total value of imported goods increased from $10.6 million in 1962 to $11.3 million in 1963 and rose sharply to nearly $16 million in 1964. Machinery and transport equipment represented about 25 percent, foodstuffs about 18 percent, and metals and minerals about 9 percent of the total value of imports. In 1963, for example, the value of major metal and mineral imports amounted to $1,080,000, of which $531,000 was expended for mineral fuels, $269,000 for iron and steel semimanufactures, and $205,000 for cement.

France (including Martinique and Guadeloupe) has dominated French Guiana trade, supplying 78.7 percent by value of all imports and receiving 63.2 percent of all exports during 1962–63. The United States (machinery and transport equipment) and the West Indies Federation (petroleum products) were the principal other suppliers with shares of 4.4 percent each of total imports. The United States received about 7.4 percent of French Guianese exports, most of which were unspecified special transactions.

COMMODITY REVIEW

Metals.—*Bauxite.*—Interest in French Guiana bauxite has been manifested since the early forties but as of the year of review none of the deposits had been worked on a commercial scale. The most important of these deposits occur southeast of Cayenne along a belt about 35 kilometers long in the Roura and Kaw Mountains between the towns of the same names. Drilling and surficial exploration of the deposits has indicated a reserve of about 40 to 60 million tons. Most of the ore is reported to be of medium grade with a low silica content, although 1 or 2 million tons of high grade white bauxite is said to occur in one deposit.

Bauxite also occurs at Lucifer Mountain, about 75 kilometers south-southwest of Sinnamary, where ore reserves have been estimated to total roughly 10 million tons. A small deposit occurs in the southeastern part of Cayenne Island and other deposits also may be associated with laterite cappings of hilly areas in the northern part of the Department. Many of these hills have been explored, at least superficially, by the Bureau Minier Guyanais, but no important deposits other than those already mentioned have been reported.

In 1958 the Kaiser Aluminum and Chemical Corp., was granted an option to explore and develop the Roura-Kaw deposits. As a result, Société Guyanaise du Bauxite was organized and registered as a French firm with Kaiser as the predominant and controlling investor and Bureau Minier Guyanais as the minority shareholder. Kaiser took up the option at the end of 1960 and agreed to mine 500,000 tons of bauxite prior to the January 1966 expiration date if commercial quantities of ore were found during the exploratory period. Exploration was completed in August 1962 and in 1964 a joint Kaiser-Olin Mathieson Chemical Corp team visited the area to further consider a mining operation. At yearend, however, the company had not yet indicated whether or not it intended to undertake actual mining of the bauxite.

Although the Roura-Kaw deposits are relatively close to a network of navigable waterways, the lack of deepwater port facilities in French Guiana presents a major deterrant to any large scale bauxite mining and export operation. Kaiser had considered constructing such facilities in the Iles du Salut. It now appears that these islands as well as a possible port site at Kourou on the opposite mainland will be preempted for use by a proposed French missile complex, and the development of a new and costly port facility near the mouth of the Mahourey River apparently offers the best solution to the critical shipping problem.

Despite unresolved shipping and other problems, local French officials were of the opinion that Kaiser will seek, and probably receive, an extension of its option and thus maintain a certain amount of control over the deposits in case their exploitation should become more attractive in the near future.

The Harvey Aluminum Inc. has shown some interest in the Lucifer Mountain deposits but apparently has not asked for an option to explore or exploit them.

Columbite-tantalite.—Alluvial columbite-tantalite has been recovered from time to time on a small scale, principally in the basin of the Sinnamary River about 30 kilometers from the coast. The principal period of activity was from 1953 to 1957 when total reported output was 37.8 metric tons, practically all of which was purchased for the U.S. national stockpile. A few tons of concentrate also was recovered during 1963 and 1964. This material reportedly contained 52 percent Cb_2O_5 and 48 percent Ta_2O_5.

Gold.—Gold was discovered in French Guiana in 1855 and in the last years of the century an estimated 12,000 to 26,000 prospectors were searching their fortunes in the territory and disputed border areas. From 1874 until 1942 officially recorded exports of crude or native gold annually exceeded 1 metric ton (32,151 troy ounces), reaching a peak of 4,922 kilograms (158,246 ounces) in 1894. Total exports from 1860 through 1964 amounted to nearly 166 metric tons or more than 5 million ounces. However, the above figures do not represent the entire production, because much gold moved outside of regular trade channels into Brazil and Surinam and was not recorded.

Gold output fell off markedly after World War II and exports reached a low of 47 kilograms (1,511 ounces) in 1954. After World War II it became more and more difficult to eke out a living in the goldfields, and the number of prospectors has dwindled from 2,000 or 3,000 to only a few hundred because more remunerative employment and far better living conditions could be obtained in the urban and agricultural areas of the coastal strip.

In recent years most of the gold produced has come from a few organized operations. The most important of these have been the Société de Développement et de Génie Civil pour la Guyane Française, a joint Franco-American corporation which worked the Boulanger concession on the Compté River about 50 kilometers southwest of Cayenne, and the Société Nouvelle de Saint-Elie et Adieu Vat which worked a concession at Sophie on the Mana River. The Boulanger mine ceased operations in September 1961 for lack of workable ground and the Sophie mine closed down at the end of 1963 because of serious operational difficulties. In 1964 unidentified U.S. interests were reported to be investigating the possibility of exploiting a concession at Paul Isnard, 90 kilometers south of Saint Laurent-du-Maroni, where reserves are estimated at 5 or 6 metric tons of gold.

Manganese.—A French corporation known as Société du Manganese de Guyane (SOMAG) was formed in 1958 by the Union Carbide Corp. (55 percent interest) and the Bureau Minier Guyanais (45 percent) to explore for manganese ores. A 2-year search failed to disclose the existence of deposits of commercial interest.

Mineral Fuels.—Mainland French Guiana has no known reserves of petroleum or natural gas, but commercial deposits may yet be found on the adjacent Continental Shelf. In August 1964 exploration rights to an offshore area of 34,700 square kilometers were granted to Société de Participations Pétroliéres (PETROPAR), a subsidiary of the French Bureau de Recherches de Pétrole. A consortium of French interests—PETROPAR, Régie Autonome des Pétroles (RAP), Société Auxiliaire de la Régie Autonome des Pétroles (AUXIRAP), and Société de Recherches et d'Exploitation de Pétrole (EURAFREP), a private company—then joined with affiliates of Gulf States Land and Industries Inc. of New York to explore the group's concessions to offshore areas of French Guiana and Surinam. Initial operations off French Guiana began late in 1964 with an aerial magnetometer survey of the entire shelf area by the Canadian Aero Service Corp. Exploration planned for 1965 includes an offshore seismic survey.

SOURCE MATERIALS

Background material and information on specific mineral commodities are based in part on dispatches of the U.S. Consulate in Martinique and annual reports of the Bureau de Recherches Géologiques et Minières and in part on articles published in the January 1964 issue of Annales des Mines (Paris, France) and the August 1965 issue of the Journal of the American Association of Petroleum Geologists. In the cited issue of Annales des Mines, B. Esambert traces the history of gold mining in French Guiana, with emphasis on mining legislation and economic factors pertaining to the activities of individual gold washers, and presents numerous statistical tables.

Statistical data on imports were derived mostly from publications of the Statistical Office of the European Communities.

PARAGUAY[5]

Paraguay's small mineral industry, which has been restricted to the production of a few nonmetallic minerals and mineral products, progressed toward a new dimension in 1964 as major construction began on a new oil refinery. When it goes on stream in 1965, the refinery will process imported crude oil; sporadic attempts to discover a domestic source of petroleum have proven fruitless thus far. In traditional sectors of the industry, a construction boom stimulated production of cement, lime, sand, and crushed rock. Road, bridge, and dam projects already underway or planned for the near future are expected to further increase output.

---

[5] Prepared by Garn A. Rynearson, physical scientist, Division of International Activities.

A period of broad economic growth, which began in 1962, continued throughout the year and an annual increase of about 4 percent in GNP was indicated for both 1963 and 1964. The cost-of-living index rose a mere 2.6 percent, in sharp contrast to the inflation experienced by neighboring countries. Total value of exports rose 23.8 percent to a record $49.8 million, whereas imports remained relatively stable with an increase of 3.6 percent to $33.8 million. A marked increase in import levels, particularly for metals and capital goods, occurred during the latter part of the year. Those levels are expected to remain high for some time in response to demands by new industrial and development projects and because of increased availability of foreign exchange resulting from large trade surpluses accumulated during 1963 and 1964.

PRODUCTION

Mineral production data have been reported on a regular annual basis only for cement and lime and the limestone required for their manufacture.

TABLE 6.—Paraguay: Production of selected minerals

(Metric tons)

Commodity	1960	1961	1962	1963	1964
Cement	14,000	15,737	16,900	18,500	22,500
Lime	13,400	14,046	14,800	12,500	17,800
Limestone:					
For cement (approximate)	26,000	28,500	32,000	33,600	40,500
For lime (approximate)	20,000	21,000	22,000	19,000	26,700

Quantitative data on other nonmetallic minerals produced in the country during 1964 were compiled by the U.S. Embassy at Asunción from information supplied by the Ministry of Public Works and Communications and various industrial sources as follows:

Commodity	Metric tons	Commodity	Metric tons
Clays:		Stone:	
Kaolin	55	Crushed rock	730,000
Other	300,000	Rough stone	450,000
Gypsum	780	Building stone, semidressed	35,000
Ocher	55	Flagstone	15,000
Sand:		Paving blocks	150
Common	185,000	Talc	47
Glass	70		

With the exception of gypsum and crushed rock, most of these commodities probably have been produced in roughly equivalent quantity during recent years.

Paraguay also produces appreciable quantities of some clay products. According to data published by Paraguay Industrial y Comercial, 1962 output amounted to 60.8 million bricks, 3.1 million roofing tiles, 6.9 million mosaic or other small tiles, and 1 million floor tiles (including cement tiles). These quantities probably are representative of output for 1963 and 1964 as well.

Total value of mineral commodities produced during 1964 is estimated at $5.1 million (₲643 million), including the value of clays but not the value of finished brick and tile.

TRADE

Paraguayan exports of mineral products are insignificant. In 1962, 540 tons of cement, 400 tons of unspecified stone, and 28 tons of ocher with a total value of only $21,100 were exported to Argentina. Exports of 100 tons of cement in 1963 and 165 tons in 1964 also went to Argentina. However, Paraguay imported all of its relatively modest requirements for metals, mineral fuels, and most nonmetallic commodities. Domestic production of gypsum, salt, and several types of refined petroleum products should eliminate dependence on imports for these items in the near future.

Available trade data do not identify all metal and nonmetallic products that are imported. The value of specified mineral commodities imported in 1963 amounted to $2.3 million for metals, $1.2 million for nonmetals and asphalt, and $4.0 million for mineral fuels, their total representing 23 percent of the value of all imports. The value of specified commodities imported in 1964 was slightly greater, but the percentage of all imports was about 1 percent less. The above figures exclude value of miscellaneous metals, metal semimanufactures, and minor mineral raw materials which are included in source data with manufactured products.

In October 1964 the Government increased the import surcharge for most general imports from the previous level of 24 percent of c.i.f. value to 28 percent. Products included in the national list for Latin American Free Trade Association (LAFTA) member countries continued to be excluded from all surcharges. Also, the special surcharge of 15 percent on petroleum products was not affected by the increase. By another decree, imports from Argentina, Bolivia, Brazil, and Uruguay, which heretofore were exempt from any surcharges, became subject to the 28-percent surcharge except that no surcharge will be made on wheat and LAFTA list products and only 10 percent will be charged on petroleum products.

TABLE 7.—Paraguay: Selected imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963 [1]
Metals:			
Aluminum, all forms	19	14	United Kingdom 13; Germany 1.
Copper, wire	81	208	Belgium 67; Germany 46; Italy 38.
Iron and steel:			
Bars, rods, and sheets, excluding tinplate.	3,075	2,966	Belgium 1,002; Germany 885; Argentina 849.
Tinplate and manufacturers thereof.[2]	1,949	5,457	United States 2,907; United Kingdom 1,857; Canada 501.
Tubes, pipes, and fittings	431	402	United Kingdom 94; France 84; Argentina 77.
Wire and manufactures thereof [3]	2,939	2,361	Belgium 1,231; Argentina 456; Germany 374.
Lead, all forms, including solder	84	102	United Kingdom 71; United States 16 Germany 6.
Tin, all forms long tons	26	5	United States 3; Germany 2.
Nonmetals:			
Cement, portland	937	634	Denmark 222; Brazil 201; Argentina 161.
Gypsum [4]	956	459	All from Argentina.
Salt	16,401	17,446	All from Argentina.
Stone, clay, earths and manufactures thereof.	4,870	2,148	Argentina 899; Uruguay 506; Germany 121.
Mineral fuels:			
Coal	129	61	Belgium 40; United States 16; Argentina 5.
LP gases [4]	58	172	All from Argentina.
Petroleum refinery products: [5]			
Gasoline	39,687	40,944	Netherlands Antilles 32,293; Argentina 7,115; United States 983.
Kerosine	17,871	19,311	Netherlands Antilles 16,842; Netherlands 8; Undisclosed 2,461.
Distillate fuel oil	11,283	16,809	Netherlands Antilles 11,564; United Kingdom 501; Undisclosed 4,269.
Residual fuel oil	51,281	54,415	Argentina 27,497; Netherlands Antilles 14,866; Undisclosed 12,044.
Lubricants	2,615	3,238	United States 1,832; Netherlands Antilles 731; United Kingdom 656.
Asphalt	2,176	9,700	Argentina 9,695; United States 5.

[1] Source does not differentiate between East and West Germany.

[2] As reported by source. Data for prior years from another source indicate containers and other manufactures constitute less than 10 percent of total listed.

[3] Includes nails, fencing, cable, and other manufactures of wire.

[4] Argentina exports to Paraguay.

[5] Excludes refinery gases and asphalt.

Source: Boletim Estatistico Mensual, issued by the Banco Central del Paraguay and Comercio Exterior of Argentina.

COMMODITY REVIEW

Metals.—*Manganese.*—A concession to exploit manganese ore in the vicinity of Emboscada in the Central Department was granted to a Paraguayan, indicating a continued interest in the possibility of finding workable manganese deposits in the country. Concessions were granted in three other areas in 1963 but no significant discoveries were announced. Known manganese occurrences are reported to be of little or no commercial interest although those near Emboscada reputedly are the richest and might warrant a small-scale operation.

Nonmetals.—*Cement.*—The only cement producer in Paraguay, Vallemí, S.A., was reorganized from a government-run entity into a mixed State-private enterprise. Improved management was reflected in an announced price reduction of about 3 percent by the principal distributor of Vallemí cement. Also, with the help of a United Nations technical advisor, the plant at Puerto Vallemí increased output by 28 percent over the previous record set in 1963. However, output of the aged one-kiln plant attained only two-thirds of nominal capacity of 35,000 tons. The company planned to undertake a $2.2 million program of modernization and expansion of facilities upon final approval of a $1.57 million loan from the Inter-American Development Bank. Increased demand for cement is anticipated, specifically for the hydroelectric project on the Acaray River, and the Government reportedly was giving serious consideration to the use of concrete instead of imported asphalt for new roads.

Gypsum.—Commercial production of domestic gypsum was begun on a small scale in 1963; location and extent of the deposit being worked were not disclosed. Although lack of mechanized mining equipment has limited output by this new enterprise, its production has resulted in a sharp decrease in imports of Argentine gypsum for cement manufacture and other purposes.

Salt.—The Paraguayan firm Construcciónes e Inmuebles, S.A. (CEISA), was granted a concession to exploit salt deposits in the vicinity of Lambaré, a few kilometers southeast of Asunción. A geologic study of the area reportedly indicated the salt reserve to be about 1 to 2 million tons and CEISA began negotiations to acquire machinery and equipment to extract and process about 25,000 tons of salt per year.

Salt was recovered from surface efflorescences and brine wells in the Lambaré area many years ago but no recent commercial production from this or several other similar known occurrences is recorded. Salt requirements of the country have been supplied by imports, mostly from Argentina. During 1960–64 such imports averaged about 15,500 tons per year.

Mineral Fuels.—*Petroleum.*—At mid-year it was reported that a U.S. company (not identified) had been authorized to prospect for petroleum in the western part of the Paraguayan Chaco for a period of 12 months. The 17-month concession granted to Petróleo Guaraní, S.A. (PEGASA), early in 1963 for exploration in the southern Chaco apparently was not extended and it is presumed that results were not encouraging.

Universal Oil Products Co. of Des Plaines, Ill., in conjunction with Fish Engineering, Inc., of Houston, Tex., began construction of a 10,000-barrel-per-day refinery for Refinería Paraguaya, S.A. (REPSA), at Villa Elisa a few kilometers south of Asunción. Completion of the refinery was scheduled for about mid-1965. Inasmuch as oil has not yet been found in commercial quantities in Paraguay, REPSA will process imported crude oil into gasoline, kerosine, jet fuel, and diesel oil. Previously reported plans to build a pipeline from Bolivia to Asunción have been displaced by a contract with the French firm Société pour la Valorization des Pétroles Bruts (SOVAP) to supply REPSA with Saharan crude oil over a period of 5 years starting January 1, 1965. Yacimientos Petrolíferos Fiscales of Argentina may also supply some crude oil.

The Paraguayan Government granted the refinery concession to Bolivian Oil Company International, S.A., a firm incorporated in Uruguay with financial participation by Interfinancial Corp. of New York. Refinería Paraguaya, S.A., was organized as a local firm to operate the refinery and an official of Fish Engineering, Inc., was appointed to the Board of Directors. In the latter part of 1964 the West German firm Ferrostahl granted REPSA DM16 million (US$4 million) in credit for the purchase of refinery machinery; Deutsche Bank and Banco de la Caja Abrera de Montevideo were joint guarantors of the loan.

A new distributor of petroleum products, Petropar, S.A., was formed with 30 percent domestic capital and 70 percent foreign capital; the foreign capital was provided mainly by a Uruguayan company entitled Urupetrol. The new firm is distributing Mobil products and presumably was formed to distribute products of the new refinery when that plant goes on stream.

Esso Standard of Paraguay, S.A., was authorized a $300,000 gas bottling plant in Asunción during 1964. Esso has been one of the two gas suppliers in Paraguay and previously imported the bottled product from Argentina by truck or ship. Although gas is more expensive, more and more Paraguayans are switching from kerosine or fuelwood to gas, and Esso expected to double or triple the initial bottling capacity of the new plant in 1965.

URUGUAY [6]

No oustanding developments occurred in the small and rather limited Uruguayan mineral industry during 1964. Output in nearly all sectors of the industry rose substantially above the depressed levels of 1963, mainly as the result of increased construction activity and improvement in the market for the mineral products that Uruguay exports to Brazil and Argentina. Although the Government-owned petroleum refinery set a new production record, below-normal economic conditions did not encourage expansion or diversification in other sectors of the industry and completion of a new cement plant apparently was deferred. Interest in low-grade iron ore deposits in two areas continued and further studies and exploration were to be undertaken.

---

[6] Prepared by Garn A. Rynearson, physical scientist, Division of International Activities.

Official statistics are not compiled on total investment, employment, or earnings in the mineral industry, and government estimates of the percentage of gross national product represented by the industry are not available. Refining of imported crude petroleum makes the largest contribution by far, followed by cement manufacture. The total value of all other mineral products is comparatively small. The U.S. Embassy at Montevideo estimated that the industry employed approximately 4,000 persons and that about half of these were engaged in the extraction and processing of marble and granite.

PRODUCTION

The list of mineral commodities produced in Uruguay during 1964 remained much the same as in previous years. Ferrosilicon was a notable addition. The first reported production of a small quantity of phosphate rock probably had little commercial significance. As in 1963, production of an appreciable quantity of iron ore was reported but neither the source nor intended use was disclosed. Small quantities of ocher also may have been produced although none has been reported since 1958.

Statistical data for some of the more important minerals are incomplete, particularly those for quarry products. Except for the quantities exported, no information on output of granitic dimension stone has been reported since 1953. The specific quantities of clay and limestone extracted for use in the manufacture of cement and lime or for other purposes also are unavailable. Furthermore, it is probable that data reported for sand and gravel represent only the output of registered producers.

TABLE 8.—Uruguay: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Secondary metal	NA	NA	NA	NA	150
Semimanufactures	NA	NA	NA	NA	1,500
Iron and steel:					
Iron ore	---	---	---	1,031	1,667
Crude steel [1]	9,738	9,200	8,567	6,500	14,327
Ferrosilicon	---	---	---	---	[e] 800
Rolled products	NA	NA	[1] 23,563	[1] 21,970	[e] 39,000
Nonmetals:					
Alum schist	472	168	136	79	35
Barite	---	100	---	---	---
Cement	414,754	389,095	374,420	339,727	412,164
Clays:					
Refractory	142,786	66,351	1,681	3,217	484
Other [2]	24,787	16,047	9,286	NA	36,000
Dolomite	991	11,324	[3] 703	26,806	26,937
Feldspar	724	891	703	287	897
Gem stones, exports [4]	70	72	81	92	103
Lime	NA	NA	[e] 32,400	[e] 30,000	[e] 42,000
Limestone	865,825	698,071	601,356	[3] 277,783	750,394
Mica	NA	NA	NA	43	---
Phosphate rock [5]	---	---	---	---	100
Quartz	3,218	1,748	739	1,681	1,256
Sand and gravel:					
Common sand	1,085,014	551,174	513,416	470,667	441,906
Quarry sand	29,830	23,438	30,881	32,401	35,234
Gravel	429,638	114,654	108,473	32,624	47,447
Stone:					
Granite, exports	190	942	1,775	896	1,236
Marble	1,630	1,557	1,188	2,043	1,140
Paving blocks	2,060	693	53	1,173	1,068
Curbstone ... linear meters	1,170	NA	NA	NA	NA
Rough stone	86,930	[r] 62,565	94,807	39,738	61,087
Ballast	857,324	430,473	341,997	321,877	344,857
Talc	2,991	1,685	1,715	1,715	2,124
Mineral fuels:					
Coke, gashouse	31,563	23,476	22,551	21,160	20,850
Manufactured gas ... million cubic feet	1,131	1,105	1,123	NA	NA
Petroleum refinery products: [6]					
Gasoline ... thousand 42-gallon barrels	2,083	2,054	2,477	2,328	2,385
Jet fuel ... do	53	58	121	88	107
Kerosine [7] ... do	1,439	1,370	1,323	1,434	1,509
Gas oil ... do	1,181	1,305	1,390	1,485	1,842
Diesel oil ... do	302	253	349	513	488
Residual fuel oil ... do	4,166	4,442	4,474	4,130	4,367
LP gases ... do	13	26	83	53	183
Asphalt ... do	65	71	123	81	61
Turpentine ... do	31	31	36	26	25
Other ... do	13	6	46	108	63
Total ... do	9,346	9,616	10,422	10,246	11,030
Refinery fuels and losses ... do	143	182	285	158	127
Total refinery throughput ... do	9,489	9,798	10,707	10,404	11,157

[e] Estimate. [r] Revised. NA Not available.

[1] As reported by Instituto Latinoamericano del Fierro y el Acero (ILAFA).

[2] Reported as common clay for 1960–62 and as clay used in cement for 1964. Data probably do not represent total production of either category.

[3] As reported.

[4] Mostly agate but probably includes some amethyst.

[5] As reported, probably represents guano-phosphatized volcanic or other igneous rock.

[6] Data are derived from quarterly refinery reports and may not agree exactly with data adjusted on an annual basis.

[7] Specified for common use.

TRADE

Uruguay continued to produce only a few mineral commodities for export, and the total value of such exports has regularly constituted only about 1 percent of the value of all exports. However, imports of mineral commodities have represented about 20 percent of all imports. The country has been completely dependent on imports for metals, coal, crude petroleum, and most nonmetals except cement, lime, sand, and gravel. In addition, some petroleum refinery products have been imported to supplement domestic output.

TABLE 9.—Uruguay: Value of exports and imports of metals and minerals

(Thousand U.S. dollars)

Commodity	Exports			Imports[1]		
	1962	1963	1964	1962	1963	1964
Metals:						
Iron and steel	22	79	395	12,490	7,357	10,597
Other	----------	1	----------	3,039	2,242	5,036
Total	22	80	395	15,529	9,599	15,633
Nonmetals	619	426	1,461	3,368	2,015	3,824
Mineral fuels:						
Crude petroleum	----------	----------	----------	24,527	20,719	22,221
Other	558	148	188	5,764	4,489	3,830
Total	558	148	188	30,291	25,208	26,051
Grand total	1,199	654	2,044	49,188	36,822	45,508
All other commodities	152,232	162,552	176,896	179,805	138,635	150,239
Total trade	153,431	163,206	178,940	228,993	175,457	195,747

[1] Excludes temporary imports.

Source: Banco de la República Oriental del Uruguay.

TABLE 10.—Uruguay: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum kilograms	----------	670	All to Paraguay.
Iron pipe and accessories	171	636	All to Argentina.
Nonmetals:			
Cement, portland	1,771	3,135	Brazil 3,085; Paraguay 50.
Dolomite	5,000	11,500	All to Argentina.
Gem stones:[1]			
Rough kilograms	80,713	91,636	Japan 44,564; West Germany 38,349; United States 7,607.
Cut or polished do	[2] 3	2	All to United States.
Sand, gravel, and broken stone:			
Sand[3]	312,050	149,000	All to Argentina.
Gravel	[4] 67,637	27,000	All to Argentina.
Broken stone	21,300	3,500	All to Argentina.
Stone, dimension:			
Granite	1,775	896	West Germany 570; Italy 170; Austria 156.
Marble	78	86	All to Argentina.
Mineral fuels: Liquefied petroleum gas	10,255	4,040	Argentina 3,538; Brazil 502.

[1] Variety not specified, probably agate but may include some amethyst.
[2] Excludes unspecified quantity valued at $448.
[3] Excludes unspecified quantities valued at $5,000 for 1962 and $2,283 for 1963.
[4] Excludes unspecified quantity valued at $3,168.

Source: Exportaciones Cumplidas, Departamento de Investigaciones Económicas, Banco de la República Oriental del Uruguay.

TABLE 11.—Uruguay: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:[1]		
Aluminum:		
Bauxite	1,100	900
Alumina	71	33
Hydrated alumina	900	601
Metal:		
Unwrought	959	1,186
Powder	10	10
Semimanufactures	14	28
Antimony:		
Oxide ... kilograms	800	1,400
Metal, unwrought	5	35
Arsenic, white	42	54
Chromium oxide	14	15
Copper:		
Sulfate ... kilograms	460	100
Metal, including alloys:		
Unwrought	300	29
Powder ... kilograms	2,315	1,870
Semimanufactures	678	706
Gold bullion ... troy ounces	----------	888
Iron and steel:		
Oxides	283	59
Scrap	----------	19
Powder	3	----------
Ferroalloys	182	163
Pig iron, ingot steel, and other primary forms	30,631	22,902
Bars, rods, angles, shapes, and sections	14,181	7,150
Plates and sheets:		
Uncoated	17,051	10,733
Coated:		
Tinplate	6,521	4,325
Other	150	17
Hoop and strip	2,637	2,342
Rails and railway materials	706	2
Wire	12,102	6,692
Tubes, pipes and fittings[2]	686	255
Lead:		
Oxides	136	104
Metal, all forms	1,056	1,493
Manganese oxides ... kilograms	3,496	7,000
Mercury ... 76-pound flasks	52	47
Nickel ... kilograms	3,466	1,889
Platinum and paladium ... troy ounces	64	64
Silver bullion ... do	3,215	6,430
Tin:		
Unwrought ... long tons	87	55
Babbitt metal ... kilograms	7,104	3,894
Titanium oxide	293	310
Zinc:		
Oxide ... kilograms	6,381	14,283
Lithopone	482	152
Metal:		
Unwrought	878	238
Semimanufactures	105	74
Other metals and alloys, not specified	37	101
Nonmetals:[1]		
Abrasives[3]	41	63
Alums	40	20
Barium compounds:		
Barite, natural	50	17
Barium sulfate, precipitated	11	2
Borates, including boric acid	263	286
Calcium carbide	1,504	150
Caustic potash	360	361
Caustic soda	5,436	2,524
Cement:		
Refractory	71	48
Special, not specified	34	5
Chalk	20	11
Clays:		
Bentonite	42	21
Kaolin	857	1,019
Other	191	256
Cryolite	7	----------
Feldspar	1	1

See footnotes at end of table.

TABLE II.—Uruguay: Imports of metals and minerals.—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963
Nonmetals—Continued		
Fertilizer materials:		
Phosphates:		
Phosphate rock and Thomas slag, unground [4]	37,749	6,000
Thomas slag, ground		6,502
Dicalcium phosphate	4,265	3,000
Other	900	506
Sodium and potassium nitrates	373	507
Ammonium sulfate	8,676	3,982
Fluorite	81	70
Gem stones, cut or polished grams	229	
Graphite	10	28
Gypsum	3,965	14,569
Infusorial earths	275	442
Mica and micanite kilograms	3,573	1,664
Refractory bricks and similar products	1,537	506
Salt	10,813	5,204
Soda ash	9,169	5,887
Sulfur	6,470	3,790
Talc kilograms	500	600
Mineral fuels: [5]		
Coal	55,504	43,256
Coal coke	1,133	1,704
Petroleum:		
Crude:		
For consumption thousand 42-gallon barrels	10,323	9,521
In transit do	265	621
Total do	10,588	10,142
Refinery products:		
Gasoline:		
For consumption do	44	46
In transit do	6	12
Kerosine do	106	128
Distillate fuel oil:		
For consumption do	267	340
Bunkers do	26	
In transit do	17	16
Residual fuel oil:		
For consumption do	402	
Bunkers do	157	
In transit do	15	17
Lubricants:		
For consumption do	111	91
In transit do	2	1
Paraffin and vaseline do	4	3
Other [6] do	2	1
Total do	[7] 1,162	[7] 657
Carbon black	1,042	770

---

[1] Data compiled from Importaciones Cumplidas issued by the Departamento de Investigaciones Económicas of the Banco de la República Oriental del Uruguay. Excludes some imported goods for which source gives unspecified units of quantity or value only. Unless otherwise noted, the value of such imports represents only a few percent of the total value for a given commodity. Some data shown for 1963 may be subject to correction because of possible misinterpretation of almost illegible ciphers common in available copies of the source material.

[2] Excludes an unspecified quantity of pipe imported from France with a declared value of $76,839, representing 26 percent of total value of pipe imports.

[3] Includes pumice and unspecified abrasives in crude or powdered form. Excludes diamond and other natural or synthetic gem stone materials, grindstones, millstones, and prepared abrasive compounds.

[4] Excludes unspecified quantities valued at $71,875 for 1962 and $11,069 for 1963, representing 8.5 and 8.6 percent, respectively, of the total value of imports of these commodities. Source given in footnote 5 shows total imports as 45,984 tons in 1962 and 19,000 tons in 1963.

[5] Data compiled from Resumen Mensual de Importación de la República Oriental del Uruguay issued by Impressora Mayo S.A. Source reports some petroleum imports in gravimetric units. Conversion to volumetric units based on conversion factors in use by Bureau of Mines. In transit imports are not defined by source, and at least part of such imports probably should be considered as imports for consumption.

[6] Petroleum naphtha, solvents, and turpentine, including some turpentine of vegetable origin.

[7] Data do not add to total shown because of rounding.

The volume of imports has been markedly influenced in recent years by a series of government measures intended to improve the chronically unfavorable trade balance and to curb irregular import practices.

The sharp reduction in 1963 of imports of most major commodity groups, including metals and minerals, can be attributed to the impact of an increase in surcharges in April of that year and the devaluation of the Uruguayan peso in May. In addition to increasing existing surcharges, the Government imposed a 20-percent surcharge on most commodities that previously had been exempt and that collectively accounted for about half of all imports in 1962.

A higher level of imports was reached during 1964, largely because the official foreign exchange rate remained stable during most of the year while internal prices rose by an average of 40 percent. The increase also reflected a somewhat higher level of industrial activity during the year. In addition to notable increases in imports of iron and steel and crude petroleum, imports of fertilizers increased markedly as a result of the credit policy adopted by the Bank of the Republic to encourage planting of grain crops.

On July 9, 1964, a law was promulgated granting assistance to firms processing export products if such assistance should be necessary to make their products competitive in the international market. The benefits include reimbursement of up to 20 percent of the f.o.b. value of the exports and refund of surcharges levied on imported components. This law was followed by a Finance Ministry decree dated December 17 which created the Advisory Board for the Promotion of Non-Traditional Exports (Junta Para la Promoción de Exportaciones No Tradicionales.) The objective of this board was to encourage the expansion and diversification of the country's nontraditional exports, which constituted less than 2 percent of all exports in 1964. In addition to assisting the marble and granite industry in locating markets and obtaining needed investment, the board also planned to concern itself with the export promotion of agates, amethysts (rough and worked), portland cement, sand, dolomite, calcium carbide, ferrosilicon, and aluminum, copper and bronze manufactures.

COMMODITY REVIEW

Metals.—*Iron and Manganese.*—The Instituto Geologico del Uruguay concluded a drilling program, totaling 1,940 meters, and other field studies of the Valentines iron ore deposit in the northeastern part of the Department of Florida about 260 kilometers north of Montevideo. Ore reserves were estimated to total about 20 to 30 million tons with a grade of 40 to 45 percent iron. The hematite-martite-magnetite ore is the itabirite type and would require beneficiation and agglomeration to yield a commercial product. The deposit is about 6 kilometers from the railroad at Valentines. A U.S. firm was to make a feasibility study to assess the economic aspects of mining and treating the ore for domestic use or for export to Argentina.

The West German firm of Rheinstahl-Krupp has indicated an interest in similar iron deposits near the village of Zapucay about 20 kilometers southeast of Minas de Corrales in the Department of Rivera. Press reports estimating ore reserves of 200 to 300 million tons may be somewhat exaggerated as geologic reconnaissance of the area in 1962 indicated the order of magnitude to be only a few million tons of itabirite containing 30 to 50 percent iron, although more detailed mapping and exploration may prove that itabirite is more extensive than was evident at that time.

Numerous small deposits of manganese ore are associated with the itabirites near Zapucay and in other parts of the general region. Some have been worked on a small scale in the past. The Cerro de Avestruz deposit, one of the largest found, was estimated to contain about 30,000 tons of ore averaging about 40 percent manganese.

Uruguay had no facilities for smelting either domestic or imported iron ores and only a limited capacity for processing crude metal and scrap. Virtually all of its modest iron and steel requirements therefore continued to be imported either in the form of crude metal (pig iron, steel ingots, or equivalent forms) or as semimanufactures. Imports of these materials during 1960–64 averaged about 80,000 tons per year, of which about 25,000 tons were crude metal forms.

The Montevideo firm of CINOCA, S.A., was a major consumer of imported crude metal, specializing in the production of welded and seamless pipe some of which has been exported to Argentina. Other CINOCA products included malleable iron, alloy steels, iron and steel castings, carbide, acetylene, oxygen, and nitrogen. The electric furnace used for making carbide can also be used for making small quantities of ferroalloys. The company announced an initial export order of 50 tons of ferrosilicon for the Argentine military establishment.

Uranium.—Administración Nacional de Combustibles, Alcohol y Portland (ANCAP) has agreed to provide equipment and personnel for a nationwide search for possible deposits of uranium to be conducted by the Uruguayan Atomic Energy Commission. Except for monazitic beach sands, no significant deposits of radioactive materials are known to exist in Uruguay. The monazite in the beach sands reportedly contains about 4.5 percent thorium oxide.

Nonmetals.—*Cement.*—The Uruguayan cement industry recovered strongly from the progressive slump in production suffered during 1961–63; however, 1964 output did not quite attain the high levels of 1957–60 during which three plants operated at near capacity and total annual output averaged almost 422,000 tons. Production for the year comprised 384,681 tons of common portland, 4,824 tons of white portland, 12,709 tons of rapid-hardening, and 9,950 tons of masonry cement.

Although major private construction remained at a low level, domestic sales of cement rose 13 percent because of an increase in small private projects, especially in the interior, and a 7-percent increase in public construction. The industry also benefited from a sevenfold increase in cement exports to Rio Grande do Sul, Brazil, which amounted to 22,380 tons in 1964, and resumption of exports to Argentina.

Mineral Fuels.—*Petroleum.*—Administración Nacional de Combustibles, Alcohol y Portland (ANCAP), the Government agency which monopolizes oil refining in Uruguay, continued to permit Esso, Shell, and Texaco distributors to import their own crude oil for processing by the ANCAP refinery. Contracts which legally expired in 1961 were renewed on a monthly basis until September when it was ruled that the last agreements would remain in force until otherwise terminated.

Total product output by the ANCAP refinery rose 7.7 percent to exceed 11 million barrels for the first time but was still far below nominal capacity. Production of gas oil, residual oil, and liquefied petroleum gas (LPG) was increased most significantly. LPG was produced mainly for export as the domestic market is limited. By an agreement concluded with its Brazilian counterpart, Petróleo Brasileiro, S.A. (PETROBRÁS), ANCAP was to supply 12,000 tons (approximately 130,000 barrels) of LPG for export to southern States of Brazil during 1964. However, available export data indicate only 5,374 tons was shipped to Brazil and that none was exported to Argentina during the year.

In May 1964 ANCAP and Yacimientos Petrolíferos Fiscales (YPF) of Argentina signed an agreement whereby the two countries would endeavor to coordinate refinery production and cooperate in matters pertaining to oil exploration, transport, and research.

Manufactured Gas.—According to the Montevideo Press, U.S. majority stockholders of Compañía del Gas de Montevideo, which produces manufactured gas and gashouse coke from imported coal, offered to sell the assets of the company to ANCAP for $5,585,000.

SOURCE MATERIALS

Unless otherwise indicated, production statistics are those reported by the U.S. Embassy at Montevideo, which obtained the data from both Government and company sources. Trade statistics were compiled from official and unofficial publications as noted. Other information was derived largely from U.S. Embassy dispatches, supplemented by items published in the Fortnightly Review of the Bank of London & South America and the Revista de la Unión Industrial Uruguaya.

Complete official trade statistics are not available. Those published by the Banco de la República Oriental del Uruguay reflect only those transactions actually reported to the bank and numerous entries show value but not units of quantity. Bank data for the relatively few mineral commodities exported are presumed to be essentially complete but those for the more numerous commodities imported are known to be incomplete, particularly those for mineral fuels.

Trade statistics also are compiled and published monthly by Impressora Mayo, S.A., a private firm whose information is derived from import manifests and verified by checking actual loading and discharge of ship cargo. Although these unofficial statistics are not strictly comparable to those published by the bank and do not include value data, they appear to be more complete quantitatively and were used in compiling data on imports of mineral fuels. Value of mineral fuel imports is from bank data, however.

Both sources list trade commodities more or less alphabetically in general categories rather than according to one of the more generally accepted classification systems. Neither source gives the total distribution by country for each commodity traded and no attempt was made to search the data for principal sources of the numerous mineral commodities imported.

Regional Mineral Industry Review of Europe

By L. Nahai[1] and Roman V. Sondermayer[2]

THE OUTPUT of the mineral industry in 1964 in both non-Communist and Communist Europe[3] showed an upward trend for most countries in keeping with the higher index of overall industrial production.

Comparable indexes of mineral industry production for non-Communist and Communist Europe (including the U.S.S.R. in Asia) are not available, primarily because the U.S.S.R. does not report details of its industrial production by industrial sectors. However, available data both in the form of index numbers on production published by the United Nations and based on data as reported to the United Nations by the various countries, and actual production data for selected major commodities published by the various European countries reflect generally expanded output by both the extractive sector and the processing sector of the mineral industry in most of the 26 nations of Europe.

General manufacturing indexes are shown in the tabulation because the United Nations includes mineral processing facilities, cement kilns, metallurgical smelters and plants, as well as petroleum refineries and coal byproduct plants in the manufacturing sector.

On the basis of index numbers, the output of the extractive industries of 3 countries (Luxembourg, Portugal, and Spain) declined in 1964 compared with 1963; the extractive industry of the United Kingdom showed no significant change in output compared with that of 1963; data for 6 countries (Albania, Bulgaria, Denmark, Sweden, Switzerland, and the U.S.S.R.) were unreported; and the remaining 16 countries recorded gains by the extractive sector. The general manufacturing sector of industry, including mineral processing facilities such as metallurgical facilities, cement, and other nonmetallic mineral processing plants, coal product producers, and petroleum refineries, recorded gains in all European countries for which data were

---

[1] Chief specialist, West Europe area, Division of International Activities.

[2] Foreign minerals specialist, Division of International Activities.

[3] For purposes of this chapter, Communist Europe comprises Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, U.S.S.R. (including the U.S.S.R. in Asia), and Yugoslavia. Non-Communist Europe comprises Austria, Belgium, Denmark, Finland, France, the Federal Republic of Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

TABLE 1. **Europe: Index numbers of industrial production by sector and country**[1]

Country	Extractive industries			Manufacturing industries			All industries		
	1962	1963	1964	1962	1963	1964	1962	1963	1964
Non-Communist Europe:									
Austria	[2] 108	[2] 110	[2] 120	[3] 126	[3] 132	[3] 140	125	131	141
Belgium	[4] 84	[4] 87	[4] 91	129	137	148	123	130	140
Finland	139	148	155	145	152	162	145	151	163
France	104	98	110	124	131	139	123	129	137
Germany, Federal Republic of	102	104	105	135	140	152	132	137	149
Greece	[5] 120	[5] 115	[5] 118	121	130	144	129	138	154
Ireland	173	190	198	136	144	158	138	146	160
Italy	124	118	126	159	173	173	156	170	170
Luxembourg	94	100	95	114	114	127	112	113	124
Netherlands	110	110	116	134	140	151	133	139	150
Norway	125	127	136	124	130	141	125	133	142
Portugal	105	91	87	135	147	165	134	145	162
Spain	95	93	90	138	156	178	135	145	171
Sweden	NA	NA	NA	NA	NA	NA	126	129	138
United Kingdom	95	95	95	115	120	129	115	119	128
Communist Europe:									
Bulgaria	NA	NA	NA	NA	NA	NA	178	196	219
Czechoslovakia	[6 7] 118	[6 7] 124	[6 7] 125	[7] 144	[7] 143	[7] 149	143	143	148
East Germany	[8] 110	[8] 113	[8] 117	[8] 138	[8] 144	[8] 151	137	142	149
Hungary	[9] 120	[9] 127	[9] 134	[9] 154	[9] 169	[9] 185	149	159	173
Poland	122	126	133	147	154	169	145	153	167
Rumania	134	147	157	170	191	219	168	189	216
U.S.S.R.	NA	NA	NA	NA	NA	NA	146	158	169
Yugoslavia	139	152	164	151	176	208	148	171	198

NA Not available.

[1] Data on Albania, Denmark, and Switzerland not available. The categories "extractive industries" and "manufacturing industries" as used in this table are defined as in divisions 1, 2, and 3, respectively, of the International Standard Industrial Classification (ISIC). Major deviations from "extractive industries" definition are indicated by footnotes to the country entries; footnotes covering similar deviations from "manufacturing" and from the category "all industries" (given as reported in source) are generally omitted.

[2] Includes activities of petroleum refineries and magnesite product producers.

[3] Includes activities of stone, clay, and sand quarries.

[4] Metal mining excluded.

[5] Magnesite roasting included.

[6] Includes coal and lignite only.

[7] Crude petroleum, natural gas, and ferrous and nonferrous ore mines included under manufacturing.

[8] Coke plants, coking and coal briquet plants included under mining; sand pits and stone quarries included under manufacturing.

[9] Coal briquet plants included under mining, sand pits, clay pits, and stone quarries included under manufacturing.

available except Italy, for which the 1964 production index was on a par with that of 1963; data were not available for Albania, Bulgaria, Denmark, Sweden, Switzerland, and the U.S.S.R.

In comparison with total industrial production growth indexes, extractive mineral industry production increased by a lesser increment than did total industrial production in 15 of the 20 reporting countries, while increases in manufacturing industry production (including mineral processing) equaled or exceeded those of all industry in 15 of the 20 reporting countries.

Available mineral and mineral product production statistics for the six countries not reported by the United Nations indicate that such indexes probably would show increased levels of output for every country.

In reviewing table 2, certain facts should be borne in mind. Data on production of nonferrous metals for many of the East European countries are necessarily estimates. Although coal output in this area was considerably larger than in West Europe, a substantial part of it was brown coal or lignite. Quality considerations apply in a reverse manner to iron ore where output of Communist Europe is reported

TABLE 2.—Approximate European contribution to world mineral supplies in 1964

(Percent of world production [1])

Commodity	Non-Communist Europe				Communist Europe			All Europe
	European Economic Community	European Free Trade Association	Other	Total	U.S.S.R.	Other	Total	
Metals:								
Aluminum:								
Bauxite	7.9	(2)	3.9	11.8	12.8	8.3	21.1	32.9
Ingot	10.7	7.5	1.0	19.2	16.4	4.0	20.4	39.6
Copper:								
Mine	.1	.7	1.2	2.0	14.2	2.7	16.9	18.9
Smelter	6.5	1.0	1.1	8.6	13.4	2.6	16.0	24.6
Iron and steel:								
Iron ore	14.0	8.4	1.0	23.4	25.4	2.3	27.7	51.1
Pig iron and ferro-alloys	19.4	7.3	.8	27.5	19.7	6.0	25.7	53.2
Steel ingots and castings	19.0	8.0	.8	27.8	19.5	6.5	26.0	53.8
Lead:								
Mine	3.8	3.0	3.0	9.8	14.5	10.6	25.1	34.9
Smelter	12.3	2.1	2.3	16.7	13.8	10.9	24.7	41.4
Manganese ore	.3	----------	.3	.6	44.2	3.0	47.2	47.8
Tin:								
Mine	.2	.9	.1	1.2	10.3	.5	10.8	12.0
Smelter	11.9	10.4	--------	22.3	10.6	.3	10.9	33.2
Zinc:								
Mine	5.7	2.3	4.3	12.3	10.3	7.8	18.1	30.4
Smelter	17.3	4.7	1.7	23.7	12.5	8.2	20.7	44.4
Nonmetals:								
Cement, hydraulic	19.2	8.4	3.3	30.9	16.0	8.0	24.0	54.9
Gypsum	15.9	11.3	9.0	36.2	9.2	3.3	12.5	48.7
Magnesite	.1	18.3	3.1	21.5	30.8	11.7	42.5	64.0
Phosphate rock	.1	----------	--------	.1	22.1	.1	22.2	22.3
Pyrite	10.2	8.6	14.9	33.7	15.8	7.9	23.7	57.4
Potash (K_2O equivalent, marketable)	35.8	----------	2.5	38.3	13.6	16.5	30.1	68.4
Salt	14.4	7.8	1.8	24.0	8.9	6.6	15.5	39.5
Sulfur:								
Native	.3	----------	--------	.3	10.8	3.4	14.2	14.5
Elemental byproduct	31.2	1.5	2.7	35.4	7.7	2.4	10.1	45.5
Mineral fuels:								
Coal, all grades	12.6	7.4	.7	20.7	20.1	21.8	41.9	62.6
Coke:								
Metallurgical	24.9	6.4	.9	32.2	22.8	9.0	31.8	64.0
Other	15.2	24.1	.9	40.2	7.9	32.0	39.9	80.1
Fuel briquets	25.8	1.1	1.2	28.1	7.4	56.0	63.4	91.5
Peat	1.2	.3	1.3	2.8	96.2	.4	96.6	99.4
Gas, natural, marketed	1.5	.3	--------	1.8	17.1	3.0	20.1	21.9
Petroleum, crude	1.0	.2	--------	1.2	15.9	1.2	17.1	18.3

[1] Approximate; based on Bureau of Mines determinations of world mineral production as compiled from various sources, with estimates by staff members where data are not available. Table indicates general order of magnitude and relative importance, but percentages should not be regarded as exacting.

[2] Less than ½ unit.

on the basis of 55 percent iron content, which is higher than the average domestic iron ore smelted in West European blast furnaces.

West Europe's production of steel exceeded that of Communist Europe in total without regard for grade of steel, but smelter production of aluminum was about the same in both areas. While primary smelter copper output was larger for East Europe in the table, inclusion of secondary copper brings production in both areas closer to par, in fact that of West Europe is higher by perhaps 150,000 tons. West Europe's lead output also exceeds that of East Europe by about 130,000 tons if secondary lead is included. Cement production in West Europe totaled 125 million tons and production capacity at the end of 1964 totaled 148[4] million tons, compared with Communist European output of about 98 million tons.

While West Europe's crude oil production was only 1.2 percent of the world total compared with 17.1 percent provided by East Europe, refinery crude throughput in the West exceeded 300 million tons compared with an estimated 250 million tons for East Europe.

Mineral and mineral product trade continued to account for a significant part of total trade in both major areas of Europe, but the volume of total trade was much greater for non-Communist Europe than for Communist Europe. West Europe's mineral imports were dominated by crude petroleum, iron ore, and nonferrous ore and metals for refining. The U.S.S.R. and other countries of East Europe supplied some of these commodities in exchange for machinery and industrial equipment.

Crude exports from the U.S.S.R. and refinery products from Rumania were the most important in terms of mineral trade. U.S.S.R.'s crude exports totaled about 36.7 million tons with Italy as the largest recipient nation in Europe. These exports were facilitated by the completion of a wide-diameter, 3,300-mile pipeline from the oilfields of the Urals to Schwedt near the Baltic Sea in East Germany and to Bratislava, Czechoslovakia, on the Danube.

Other exports from the U.S.S.R. were chromite, manganese ore, and pig iron. The U.S.S.R. showed great interest in buying petrochemical plants and facilities for production of nitrogenous fertilizers from the West. Again there was a shift in the investment program of the U.S.S.R. toward heavy industry. Yugoslavia continued to export sizable amounts of nonferrous metal concentrates and crude metals. A great deal of this was shipped to the West.

In the field of mineral exploration, the North Sea and some of the Frisian Islands were the areas of the greatest activity because of the search for oil and gas. Furthermore, liberalization of concession laws in Spain has attracted capital to that country for petroleum exploration. In the U.S.S.R. exploration was active in the Cambrian formations of the Siberian plateau. Oil was discovered in this geological horizon at Markovo. Commercial crude production was begun in Tyumen Province from a field considered to be large.

NON-COMMUNIST EUROPE[5]

The expansion of mineral industry production in non-Communist Europe during 1964 and comparison with 1964 production levels of major mineral industry sectors with performance in past years are summarized in table 3 on the basis of production index numbers. For comparative purposes, similar index numbers for the nations of the European Economic Community as a group have been included.

In 1964 the gross national expenditure[6] of non-Communist European countries increased at varying rates from a minimum of 2.5 percent for Italy to 9.5 percent for the Federal Republic of Germany and 10 percent for Luxembourg.[7] The United Kingdom also had a high rate of growth of 8.3 percent, although gross domestic product increased by about 3 percent only. In a number of countries, particularly France and Italy, rate of growth during the second half of the year slowed down, mainly because of restrictive measures directed against inflation.

---

[4] 146.5 million tons for European members of the Organization for Economic Cooperation and Development (OECD) and estimated 1.5 million tons for Finland.

[5] Prepared by L. Nahai.

[6] Private consumption plus government consumption plus gross investment plus exports minus imports.

TABLE 3.—Non-Communist Europe: Index numbers of mineral industry production by sectors and total industry production

(1958=100)

	Extractive industries				Basic metals industries	Nonmetallic mineral product manufacturing	Chemical industry, coal products industries, petroleum refining	All industry
	Metal mining	Coal mining	Crude oil and natural gas production	Total				
Non-Communist Europe:[1]								
1960	108	94	144	100	124	119	128	116
1961	114	93	166	102	125	126	138	122
1962	111	93	182	104	123	134	151	127
1963	106	93	196	104	126	139	165	133
1964:								
January through March	112	99	211	110	138	136	179	141
April through June	118	94	210	109	143	167	187	145
July through September	104	85	214	101	131	162	179	133
October through December	120	98	232	112	148	161	193	152
Annual average	113	94	217	108	140	156	184	143
European Economic Community:								
1960	104	94	148	118	124	119	130	118
1961	104	93	168	125	127	126	143	125
1962	100	91	185	132	126	137	160	132
1963	87	90	199	138	128	142	176	138
1964:								
January through March	89	96	223	146	138	133	192	146
April through June	93	93	214	150	142	171	199	150
July through September	83	86	217	137	132	165	192	137
October through December	90	95	235	157	148	159	208	157
Annual average	89	92	222	147	140	157	197	147

[1] Includes Yugoslavia.

Source: United Nations. Monthly Bulletin of Statistics. New York, May 1965, 207 pp.

Inflation was a problem in most countries, primarily brought about by labor shortages that contributed to increased wages. Many countries took anti-inflationary measures. On February 27, the United Kingdom's bank rate was raised from 4 to 5 percent, the first of the Government's measures to reduce the rate of economic expansion. This rate was subsequently raised to 7 percent in November. Similarly Danish bank rates were raised from 5.5 to 6.5 percent in June and Belgian rates from 4 to 4.5 percent in July. The Swiss Government in March approved a 3-year anti-inflationary program to control credit and capital; a 1-year ban was imposed on nonessential construction; and immigration of foreign workers was restricted. Swiss bank rates were raised from 2 to 2.5 percent in July. New Italian economic stabilization measures included provision for increasing turnover tax rates on most transactions, except for basic foodstuffs, gasoline, fertilizers, seed and fodder, and certain medical expenses and loans. The rate of price increase was moderated during 1964 in France and in Switzerland and to a smaller extent in Italy; however, in the Netherlands it was accelerated as a result of exceptional wage increases.[8]

---

[7] International Monetary Fund. International Financial Statistics. V. 18, No. 6, June 1965, 326 pp.

Mineral and metal prices increased during 1964. The price index of the National Institute of Economic and Social Research for minerals and metals increased from 106 (1957=100) in the first quarter of 1964 to a maximum of 135.8 in November but declined to 130.9 in December.[9] Prices of base metals in the first three quarters ran 15 to 20 percent higher than in 1963.[10] Zinc smelters in England broke with the London Metal Exchange (LME) during the summer and started to sell at fixed prices.[11] Similarly the producer prices for copper were disassociated from LME prices. Producer prices increased but more slowly than the small quantities traded on the market. However, copper scrap prices were near the LME quotations and large tonnages of secondary copper were bought and sold on the basis of the higher prices. In July 1964, the Imperial Smelting Corp., Ltd., introduced a fixed price for zinc, a move which was followed by other producers interested in the European market.[12]

As a result of rapid growth in world demand for iron and steel products during 1964, export prices of iron and steel hardened. At the end of 1964, these prices were still about 8 to 15 percent higher than at the beginning of the year. Published home-price lists for steel products in the European Economic Community (EEC) did not on the whole vary from those of 1963. Prices did not deteriorate although under the alignment system the sale offers of home producers are aligned to the lowest prices offered. The official price schedule was actually increased for concrete reinforcing rods, merchant mill products, heavy plate, and wire rod.

PRODUCTION

The year 1964 was on the whole one of growth in industrial production in non-Communist Europe. There was, however, some slowing down in industrial output in the second half of the year. As a result of the industrial expansion, steel production increased in all non-Communist European countries except Italy, but the increase was more marked in the EEC. Production and approximate effective capacity for pig iron and crude steel production by non-Communist Europe was as follows at yearend 1964 in million metric tons:

	Production	Capacity
Pig iron	87.2	100.0
Crude steel	121.4	136.0

Effective capacity for production of certain categories of rolled products (sections, wire rod in coils, hot-rolled hoop, strip, skelp, and plates and sheets excluding coils) in non-Communist Europe (excluding Finland) totaled about 94 million tons.

---

[8] National Institute of Economic and Social Research. National Institute Economic Review (London), No. 32, May 1965, p. 22.

[9] National Institute of Economic and Social Research. National Institute Economic Review (London), No. 31, February 1965, p. 81.

[10] Page 46 of work cited in footnote 9.

[11] Page 59 of work cited in footnote 9.

[12] The British Non-Ferrous Metals Federation. Annual Report 1965. Birmingham, England, p. 8.

Production trends of the major steel-consuming industries of West Europe—motor car, investment goods industry, shipbuilding, and construction—were not uniform. Car production rose in the United Kingdom but fell in Italy and France. In the last two countries government monetary measures kept the level of investment stationary, but in West Germany and United Kingdom demand for investment goods was heavy. The construction industry generally made progress in 1964 throughout West Europe.

West Europe produced about one-fifth of the world output of primary and secondary smelter copper with West Germany, Belgium, and United Kingdom—the three largest producers in the order given. Production of copper and copper alloy semimanufactures increased both in the United Kingdom and in most other European countries. The United Kingdom retained its position as the non-Communist world's second largest producer following the United States. Output of the other principal producers concerned (Austria, Belgium, France, Great Britain, Italy, Scandinavia, and Switzerland) increased by 11 percent, to 2,724,000 tons and consumption increased by about the same proportion, to 2,524,000 tons.[13]

The lead-zinc smelter industry generally maintained its level of production. Principal producers of refined lead [14] and their shares of 1964 output in percent by countries of West Europe (excluding Finland) were: Germany 26; United Kingdom 25.5; France 15; Belgium 9; Spain 7; Sweden 6; and Italy 6. Total output was 803,000 tons. Corresponding figures for zinc [15] were Belgium 24; France 20; Germany 18; United Kingdom 12; and Italy 8. Total output was 933,000 tons.

Non-Communist European potash production in 1964 topped the 4-million-ton mark (4,380,000 tons of K_2O) for the first time and represented a 10-percent increase over that of 1963. Domestic deliveries in France were 1.04 million tons and in West Germany 1.34 million tons of K_2O, representing increases of 13 and 18 percent, respectively. West Germany exported 915,000 tons and France 809,000 tons of K_2O.[16]

In the field of energy, both crude oil and natural gas output increased. Supply of refined products (refinery output plus imports) in the European countries of the Organization for Economic Cooperation and Development (OECD)[17] totaled about 379 million tons [18] of which EEC countries accounted for 235 million tons and European Free Trade Association (EFTA) countries for 122 million tons. Inland consumption of petroleum products totaled 169 million tons in EEC countries, 100 million tons in EFTA countries, and 288 million tons in all of OECD.[19] Total annual refinery capacity stood at approximately 375 million tons (7.5 million barrels per day).

---

[13] The British Non-Ferrous Metals Federation. Annual Report, 1965. Birmingham, England. p. 9.

[14] Lead produced by smelters or refineries plus lead content of antimonial lead including production on toll in the reporting country, regardless of type of source material, that is whether ores, concentrates, bullion, mattes, residues, slags, or scrap. Remelted lead is excluded.

[15] Slab zinc produced by smelters and refineries including production on toll in the reporting country, regardless of the type of source material, that is whether ores, concentrates, residues, slags, or scrap. Remelted zinc and zinc dust excluded.

[16] Chemical Age (London). Apr. 17, 1965, p. 620.

[17] All non-Communist Europe except Finland.

[18] Organization for Economic Co-operation and Development. Supply and Disposal Oil Statistics 1964. Paris, France, 1965, p. 15.

More than 40 companies shared in the North Sea exploration for oil and gas.[20] In addition to the major oil companies, groups representing mining, industrial, and shipping interests were engaged in search operations. However, drilling was limited because of legal uncertainties. The Continental Shelf Convention, adopted in 1958 by the Geneva Conference on the Law of the Sea and ratified by some 21 countries, served as the legal framework for delimiting North Sea concessions; however, several legal problems had to be clarified before exploitation concessions could be given.

Legislation enacted in the United Kingdom extended relevant sections of the Petroleum (Production) Act of 1934 to areas beyond territorial waters and by October the Government had allotted licenses to 22 companies or groups of companies including all the major oil companies to exploit a large part of the Continental Shelf under United Kingdom jurisdiction.[21]

The Netherlands' Government announced that it would submit a bill to Parliament specifically covering the granting of exploitation rights in the sea areas, and the Norwegian Government was also preparing regulations for granting exploration and exploitation rights in the North Sea. With the clarification of these issues drilling activity probably would increase considerably in 1965.

The West German Government issued a warning that without special authorization no exploration or production activities could be undertaken in the open sea off the West German coast. Drilling in the North Sea off the West German coast was authorized and carried out by a consortium of 11 companies including Standard Oil Co. (New Jersey), Esso, Socony Mobil Oil Co., Inc., Royal Dutch Shell group, Standard Oil Co. (Indiana), and several German companies under the leadership of Preussag. This consortium obtained a formal concession which will be valid until October 31, 1967.[22] In June, the consortium found natural gas about 50 kilometers north of Juist Island.

Production of crude oil increased about 11 million barrels in 1964, to about 129.4 million barrels. All producers increased output, but more than half of the increase was credited to Italy. West Germany, however, remained the dominant producer, supplying about 43 percent of the total.

Production of natural gas (in most cases including associated gas) in non-Communist Europe did not increase dramatically—19,423 million cubic meters in 1964,[23] compared with 17,900 million cubic meters in 1963. France and Italy produced almost equal amounts, each accounting for 40 percent of the area's output. Germany and Austria were the third and fourth largest producers followed by the Netherlands.

The supply of natural gas produced in non-Communist Europe was augmented by the first deliveries of liquified Algerian gas to the United Kingdom. The gas, shipped in refrigerated tankers, was purchased under a 15-year contract calling for the delivery of 700,000 tons of gas per year.

---

[19] Page 15 of work cited in footnote 18.
[20] Petroleum Press Service (London). V. 31, No. 5, May 1964, p. 164.
[21] Petroleum Press Service (London). V. 31, No. 10, October 1964, p. 364.
[22] Petroleum Press Service (London). V. 31, No. 12, December 1964, p. 473.
[23] Petroleum Press Service (London). V. 31, No. 3, March 1965, p. 87.

TRADE

Total exports (f.o.b.) from West Europe in 1964 were valued at $69,879 million, distributed as follows: EEC $42,559 million; EFTA (including Finland) $25,323 million; and Greece, Ireland, Iceland, and Spain $1,997 million. Corresponding import figures (c.i.f.) were $80,752 million, $44,875 million, $31,628 million, and $4,249 million, respectively.[24] Export trade within OECD Europe increased 13 percent while export trade from OECD Europe to primary producers increased only 8 percent.[25] Imports of mineral fuels and related materials[26] in West Europe in 1963 totaled $7,400 million[27] of which $4,300 million was accounted for by the EEC and $2,540 by EFTA countries. Exports of the same products from West Europe were valued at $2,750, with the EEC accounting for 77 percent and EFTA countries for 21 percent. Crude petroleum was the most significant fuel import in 1964, with about 198 million tons entering the EEC and an estimated 73 million tons entering EFTA countries.[28]

The sixth or Kennedy Round of trade negotiations under the General Agreement on Tariffs and Trade (GATT) began in May with a meeting of the contracting parties. At this meeting broad policy guidelines as to the objectives of this round of tariff-cutting negotiations were established. In principle, it was agreed that a 50-percent across-the-board tariff reduction would be the objective of the negotiations. On November 16, all of the major trading partners in GATT tabled their offers on industrials along with a list of items for which tariff reductions could or would not be offered. This came about as the United States decided to proceed as scheduled in spite of disagreements concerning agricultural negotiations. The Kennedy Round negotiations differ from preceding ones in that, for the first time since 1947, the members of GATT will formally consider and negotiate legal nontariff barriers to trade. Nontariff barriers include quantitative trade restrictions, licenses, exchange controls, antidumping valuation procedures, and similar matters.

Authority to negotiate the Kennedy Round for the six EEC countries passed to the Commission. Although there was no disagreement on the basis and aims of this authority, there have been difficulties particularly with regard to exception lists and parities. No progress was made on parities where there is a substantial difference between tariffs of the Member States and other negotiating countries.

The EEC included steel and coal among commodities subject to the full 50-percent linear cuts in tariffs. A negotiating tariff of 14 percent was adopted for steel, and coal would participate on the basis of existing tariffs (mostly zero with the important exception of West Germany which has a $5 per ton duty).[29]

---

[24] International Monetary Fund. International Financial Statistics. V. 18, No. 6, June 1965. pp. 34–35.

[25] National Institute of Economic and Social Research. National Institute Economic Review (London). No. 32, May 1965, p. 25.

[26] Coal, coke and briquets, petroleum and petroleum products, natural gas, and electric energy.

[27] United Nations. Monthly Bulletin of Statistics. March 1965, p. xvii. (This figure includes imports of Turkey and Yugoslavia).

[28] Organization for Economic Co-Operation and Development. Supply and Disposal Oil Statistics 1964. Paris, France, 1965, p. 15.

REGIONAL ECONOMIC ORGANIZATIONS

The European Economic Community (EEC).—Agreement in December 1964 on unified grain prices stimulated the Community's initiative for further economic integration. Under the EEC's acceleration proposals, "Initiative 1964" to speed up the implementation of a common market, the deadlines for the completion of the customs union in both industrial and agricultural sectors were set for July 1, 1967. This will also be the date of entry into force of the common tariff for all industrial and agricultural products. Meanwhile, member countries applied a new linear reduction of 10 percent of the 1957 duties. The ideas of merging the three Executives—the EEC Commission, The High Authority of the European Coal and Steel Community, and the Euratom Commission—was advanced by yearend and seemed close to fruition.

Besides progress toward the establishment of the customs union, the EEC Commission put forward proposals for customs legislation on trade with nonmember countries, abolition of frontier controls for trade between member States, and gradual achievement of a monetary union. In the latter area, creation of a medium-term Economic Policy Committee, establishment of a Committee of Governors of Central Banks, and a Budget Policy Committee boded progress toward financial integration. The Monetary Committee's area of study was extended to matters related to international monetary systems. The work of the medium-term Economic Policy Committee may lead to community-wide economic programing.

In 1964 the Gross National Product of the European Economic Community increased 5.5 percent in real terms and 10 percent in industrial production. Total imports and exports were $44.9 and $42.5 billion, respectively. Intracommunity trade accounted for 40 percent of all imports (39 percent in 1963) and 43 percent of all exports (42 percent in 1963).

In 1964, the EEC produced about 19 percent of the world's crude steel and its share in world output of coal, iron ore, and cement was about 12.6, 14.0, and 19.2 percent, respectively. Smelting facilities of the EEC produced 17.3 percent of the world zinc, 12.3 percent of the lead, 10.7 percent of aluminum, and 6.5 percent of the copper output. Crude throughput of the Community petroleum refineries increased by 18 percent to a total of 211 million tons, and there was a rise in total coal output principally because French coal production was unhindered by strikes in 1964.

During 1954–63, investment expenditures in coal mines, iron mines, and iron and steel plants totaled $12.6 billion. Of the total, 29 percent was spent on coal mines, 3 percent in iron mines, and 68 percent in iron and steel plants. Expenditures in 1963 totaled $1,827 million and investment envisaged for 1964 was $1,611 million distributed as follows in percent: Iron mines 1.8, coal industry 21.4, and iron and steel industry 76.8.

---

[29] European Community Information Service. European Community (Washington, D.C.). No. 77, January 1965, p. 4.

In EEC countries, 734,800 were employed on September 30, 1964, in coal mines, 591,000 in iron and steel plants, and 33,700 in iron mines. The total was 12,100 less than for the corresponding period in 1963, but the overall rate of reduction was less than that of past years; for example, employment in 1963 decreased 43,000 compared with that of 1962. Moreover the number of workers in steel plants in 1964 increased by 14,000.

Energy.—The Community finally made some progress toward evolving a common energy policy. Such a policy would deal, among other things, with crude tariff dispositions, free circulation of petroleum products in the Community, and fiscal policy on petroleum products, and presumably would determine the optimum level of coal production. The Council of Ministers on April 21 adopted a resolution which is a—

> * * * Solemn declaration to cooperate in establishing a common energy policy within the framework of the merger of the three European Communities. The preamble to the resolution affirms the desire to pursue efforts towards a common policy with regard to trade and supply from third countries, State aid arrangements, and regulations and conditions for different energy sources. With regard to petroleum, the Governments, within the provisions of the Treaty of Rome, will search for a fiscal policy on petroleum products, adapted to the objectives of the energy policy, affirming their desire to progressively do away with all discrimination between their nationals and those of member states.[30]

An energy balance sheet of the Community prepared by the EEC's statistical office[31] gives gross internal or apparent consumption of energy[32] in 1964 as equal to 598 million tons of standard coal equivalent (SCE), or 20 million tons more than in 1963. This consumption was distributed as follows in million tons: Coal 240, lignite 37, gas 19, crude petroleum 269, and primary electricity 33.[33] In 1964, powerplants converted 110 million tons SCE of primary fuels (coal, lignite, petroleum products and natural gas) and secondary fuels (coke oven and blast furnace gases) into electricity; the corresponding 1963 figure was 94.5 million tons SCE.

While gross internal energy consumption increased by about 3.5 percent, petroleum consumption in individual countries increased 11 to 13 percent. Coal consumption increased only in coke plants as a result of increase in steel production and in powerplants. Electricity requirements in the Community in the last 6 years have been increasing at the rate of 6 percent each year and this has been an important factor in increased coal utilization in powerplants.

The overall increased consumption of 20 million tons of standard coal equivalent (SCE) was met by imports, mainly petroleum. External supplies of energy were generally less costly than those within the Community and the coal industry had to meet competition from imported coal and petroleum.

Net energy imports from non-EEC countries increased from 263 million tons of SCE in 1963 to 292 million tons in 1964. Net crude oil imports from third countries in 1964 constituted 281 million tons of SCE and coal imports excluding briquets were about 13 million tons of SCE. Net energy import was equivalent to 49 percent of gross internal consumption (46 percent in 1963).

---

[30] Nahai, L. Some Economic Aspects of Energy in the European Economic Community (EEC). Thesis No. 122, Industrial College of the Armed Forces, Washington, D.C., Feb. 15, 1965, 99 pp.

[31] Office Statistique des Communautés Européennes. Statistiques de l'Energie (Luxembourg). No. 3, 1965, pp. 11–19.

[32] Production plus net imports plus net stock variation minus bunker.

[33] Details do not add to total because of rounding.

Intra-Community total trade in solid fuels consisted of about 17 million tons of coal and coal briquets and about 10 million tons of coke. Intra-Community trade in petroleum products totaled almost 20 million tons of SCE.

The EEC's coal industry continued the rationalization program started in 1957. Number of producing mines was 262, compared with 415 in 1957. Output of coal per underground man-shift increased from 2,229 kilograms in 1962 to 2,331 kilograms in 1963; preliminary estimates indicate an output of 2,391 kilograms in 1964. Nearly 65 percent of the coal was produced from fully mechanized mines (both mining and loading mechanized) as compared with 38 percent in 1960. The rate of increase in productivity continued to decline, being only 2.6 percent in 1964, compared with 4.6, 6.1, 7.3, and 9.5 percent, respectively, in 1963, 1962, 1961, and 1960.

Preliminary figures indicate a 1.5-percent increase in coal production costs (including capital costs and depreciation) in the Community. The increase was brought about mainly by increased labor costs per ton of coal mined, which was 3.1 percent. Coal prices remained almost stable, in spite of an average 7-percent wage increase which was only partially compensated by an increase in productivity.

The refineries of the Community processed 211 million tons of crude oil, 17.4 percent more than in 1963. Crude distillation capacity in member countries increased from 173 million tons early in 1963 to 217 million tons early in 1964. Community experts estimate that by 1968 total capacity of the area will be about 328 million tons, excluding the Italian reserve capacity.

Heavy fuel-oil prices in the autumn of 1964, exclusive of taxes, were $11.5 to $14 per ton for the northern ports of Antwerp, Rotterdam, and Hamburg—1 dollar less than for the corresponding season of the previous year and—$10.50 to $12 for the Italian ports, $0.50 less than for the previous year. Inclusive of tax, prices varied from $15.50 to $17 for the Netherlands, Belgium, and Italy, and from $18 to $20 for France and West Germany. Prices of light fuel oils were significantly lower than in the previous year, up to a maximum of 25 percent especially in southern West Germany where new refineries were operating.

As of November 1, 1964, intra-Community tariff for petroleum products was abolished and common external tariffs were established. In November the EEC Commission also proposed that member States take all appropriate measures to maintain stocks corresponding to at least 65 days of average daily, domestic, nonmilitary consumption during the previous year for the following petroleum products: Automotive gasoline, aviation fuels (aviation gas and jet aircraft fuel), gas oils, diesel oils, and fuel oils. However, the portion of domestic consumption obtained from domestic crude output may be deducted up to 15 percent of such domestic consumption.

Long-term contracts for delivery of natural gas from the Groningen field in the Netherlands to West Germany and Belgium were concluded during 1964, and negotiations were underway with France and the United Kingdom. The producing company, N.V. Nederlandsche

Aardolie Maatschappij (NAM), a joint Esso A.G., Deutsch Shell Hamburg venture, announced that a provisional 20-year contract was signed with Distrigaz, a Belgian gas transport company, to supply natural gas at an eventual annual rate of 3 billion cubic meters. An agreement also was signed with Thyssengas A.G. of West Germany for delivery of up to 4 billion cubic meters of gas per year. Negotiations with a consortium of West German companies headed by Ruhrgas A.G. was reported in September.[34] This group may be interested in taking up the balance of NAM's offer of 15 billion cubic meters of exports annually.

Gasunie,[35] in charge of distribution of gas in the Netherlands, completed the initial phase (370 kilometers of 36-inch and 115 kilometers of 24-inch line) of a 1,000-kilometer pipeline which will form the main distribution grid for the country. These lines will be extended into Belgium and West Germany to take care of the commitments described in the previous paragraph.

Iron Ore.—Total production of commercial ore in 1964 (77,256,000 tons)[36] was 2.3 percent more than the previous year but only 86 percent of the 1960 output. Yearend stocks of ore were 11.4 million tons at mines and 18.5 million tons in steel plants and elsewhere. Intra-Community trade in iron ore, about 22 million tons, was almost the same as for the previous year but about 4 million tons less than in 1960.

On the basis of iron content, imported ores from non-EEC countries supplied 46 percent of total iron ore consumption of the Community. Iron ore imports from these sources increased from 36.6 million tons to 47.7 million tons. Imports into West Germany accounted for about three-fifths of all EEC iron ore imports. In this country iron ore production is now generally confined to captive mines; other steel producers depend entirely on imported ores.

Of the 34,857,000 tons of iron ore imported by the EEC in the first 9 months of 1964, Sweden supplied 12,398,000 tons, Liberia 5,379,000 tons, Brazil 3,806,000 tons, Mauretania 2,253,000 tons, Venezuela 2,047,000 tons, and Peru 1,437,000 tons. Average grade of iron ore smelted, including sinter, was 40.7 percent Fe compared with 38.1 percent Fe in 1962. Ore sintering increased although at a smaller rate than in previous years: 1,031 kilograms of sinter was used per ton of pig iron compared with 1,010 kilograms in 1963 and 898 kilograms in 1962. There was a corresponding reduction in coke consumption; it totaled 730 kilograms per ton of pig iron in 1964, 770 kilograms in 1963, and 814 kilograms in 1962.

Average cost of imported ore (c.i.f. Community ports), on the basis of figures for the first 6 months, was 18.00 cents per unit of iron content. Price of Lorraine ore, ex-mine, was 9.70 cents at the end of 1964 (10.15 cents at the end of 1963).

Iron and Steel.—The Community's steel production was 19.0 percent of the world's output, just slightly less than that of the U.S.S.R. It is estimated that the EEC plants operated at 90 percent of capacity compared with 83.3 percent during the previous year. Share of oxygen process steel in total steel output continued to increase, reaching 12.5 percent compared with 7.4 percent in 1963.

---

[34] Petroleum Press Service (London). September 1964, p. 334.
[35] Joint subsidiary of NAM, the Netherlands State and State-owned mines.
[36] Office Statistique des Communités Européennes. Sidérurgie (Luxembourg), No. 2, 1965, p. 178.

The steel industry's output recovered substantially in comparison with the last 5 years; the output increased 12.5 percent. Consumption in terms of crude steel was 68.7 million tons compared with 65.1 million tons in 1964.[37] The electrotechnical, metal fabrication, and machine building industries increased consumption.

Intra-Community trade in steel increased from 60 percent of the Community's total steel trade in 1963 to 63 percent in 1964.[38] Export of rolled steel to non-EEC countries totaled $890 million during the first 3 quarters of 1964, and imports from non-EEC countries totaled $260,500,000. Total Community trade in rolled steel for the same period was $1,094 million. Steel trade accounted for 5 percent of the Community's total exports and for about 1.3 percent of its imports by value.

Steel stocks increased by 4,170,000 tons to replenish stocks depleted in 1963. The increased stock caused shipments in the second half of the year to exceed new orders by 2 million tons.

TABLE 4.—European Economic Community: Salient iron and steel statistics

(Thousand tons unless otherwise specified)

	1963	1964
Pig iron and ferroalloys:		
Production:		
Pig iron	49,015	56,309
Foundry iron	2,970	3,210
Spiegel	212	166
High-carbon ferromanganese	548	643
Other pig iron	462	454
Total	53,206	60,783
Steel ingot and metal for casting:		
Production:		
Thomas	33,348	34,717
Open hearth	25,249	27,939
Electric	8,962	9,597
LD and other oxygen steel processes	5,484	10,429
Other	164	162
Total	73,206	[1] 82,838
Of which carbon and special steel	5,350	5,975
Finished steel:		
Production	51,973	[4] 58,544
Trade:		
Imports: [2]		
From the Community	11,477	[4] 13,400
From other countries	3,560	[4] 2,990
Exports:		
To the Community	11,332	[4] 13,262
To other countries	11,393	12,744
Investments: [3]		
Facilities for production of pig iron ... million dollars	253	168
Steel furnaces ... do	172	161
Rolling mills ... do	714	618
General services ... do	319	291
Total ... do	1,458	1,238

[1] Totals do not add in the original data; difference is insignificant.

[2] Includes also non-treaty items (forged and drawn items, cold-drawn wire, steel pipes and steel pipe accessories) but excludes cast iron pipes and old rails.

[3] 1964 investment figures refer to expenditures foreseen as of January 1, 1965.

[4] Extrapolated from 11 months.

---

[37] European Coal and Steel Community, The High Authority. 13th General Report on the Activities of the High Community (February 1, 1963–January 31, 1964). Luxembourg, March 1965, p. 164.

[38] Based on data extrapolated from 11 months.

The steel tariffs of five member States of the Community were raised to the high level of the Italian custom duties, which average 9 percent. A specific duty of $7 per ton was imposed on foundry pig iron to remain in effect until the end of 1965. Duties bound under GATT remained unchanged. Exceptions were authorized for commercial and technical reasons and totaled 350,000 tons. Intergovernmental agreements concluded last year, fixing quotas for imports of pig iron and rolled steel from countries with State-controlled trading regimes, were extended to the end of 1965.

Steel prices were firm and recovered to the level of official schedule prices in all countries except Italy. As a result, in 1964 1,202,000 tons of steel were aligned to prices from non-EEC countries compared with 2,268,000 tons in 1963. Indirect alignment, whereby certain plants align their scheduled prices with prices of non-EEC countries, also disappeared.

The European Free Trade Association (EFTA).—The EFTA, formed in 1960, is an industrial free trade area and not an economic union. It does not envisage any degree of economic integration or pooling of production facilities or establishment of a common external tariff. The significance of the EFTA minerals lies entirely in the area of trade policy and trade liberalization among the members. By January 1, 1965, the Association had reduced internal tariffs on industrial goods to 30 percent of the level prevailing in 1960 when the EFTA convention came into force; the remaining 30 percent is to be eliminated by 1966. The final tariff cuts at the end of 1966 will be accompanied by the lifting of the last quota restrictions on intra-EFTA trade. The Stockholm Convention provided for the removal of these barriers pertaining to trade of industrial goods.

There were three significant developments during the year. For the first time some trade diversion seemed to have taken place with intra-EFTA trade attaining the largest annual increase. This may have been caused by reduced tariffs between the members which finally came into play, but also may have been influenced by external factors, the most important being the stabilization policies introduced by Italy and France which adversely influenced rate of growth of the volume of trade between EFTA countries and EEC.

Progress made by EFTA toward the realization of a single market among the seven members received a setback when the United Kingdom imposed a 15-percent import surcharge on industrial goods imported from all sources, including EFTA. The United Kingdom also announced a new scheme of tax rebates to encourage exports. The surcharge had the effect of negating the tariff reductions accepted by the United Kingdom under the Stockholm Treaty. EFTA countries were critical of these measures, and the EFTA Council set up two working parties to study the suitability of the measures to rectify Britain's balance of payment problems and the compatibility of the new tax rebates with the Stockholm Convention. As the year ended Britain's EFTA partners were looking for an early relaxation of this surcharge.

One reaction to the surcharge imposition was the realization that if the organization is to be able to meet crisis of the type encountered, then it would have to strengthen itself. Thus the Economic Policy

Committee was activated for the purpose of following closely the economic activities and conditions in various member countries.

With regard to the Kennedy Round tariff negotiations, five countries—Austria, Denmark, Norway, Sweden, and Switzerland—did not seek any exceptions to the proposed 50-percent cut in tariffs. The United Kingdom and Finland tabled their exception lists in November.

Total intra-EFTA imports (c.i.f.) in 1964 reached $6,516 million [39] which was $1,109 higher than 1963 imports. Total exports (f.o.b.) increased 17 percent, from $5,292 million in 1963 to $6,198 million in 1964. Total intra-EFTA merchandise trade has increased by 76 percent since 1959. The 18.5-percent increase in intra-EFTA imports in 1964 was the highest since 1959.

Imports of EFTA countries, including Finland, from the rest of the world increased $3,000 million over those of 1963, to $25,095 million (c.i.f.) in 1964—an increase of 13.5 percent over those of 1963. In all, imports of EFTA countries from the rest of the world increased by more than 45 percent during 1959–64. EFTA exports to the rest of the world in 1964 recorded a smaller increase (6 percent), from $18,012 million in 1963 to $19,096 in 1964. One of the main reasons for this small increase was the fact that the United Kingdom's overall exports to the rest of the world increased by only 4 percent in 1964 and that the United Kingdom accounts for almost half of the total EFTA exports. EFTA had a trade deficit in 1964 both in trading with the United States and with the EEC as follows in million dollars:

Imports from EEC	9, 530	Imports from the United States	3, 133
Exports to EEC	6, 887	Exports to the United States	1, 947
Trade deficit	2, 643	Trade deficit	1, 186

Compared with 1963, EFTA's imports from EEC in 1964 increased 13.3 percent, but its exports to EEC increased only 6.4 percent. EFTA's imports from the United States increased 23 percent, but its exports to the United States increased only 8 percent.

With regard to trade in minerals, EEC imports of iron ore from Sweden and coal from United Kingdom were probably the most important. Iron ore imported into EEC from Sweden totaled 12,398,000 tons during the first three quarters of 1964, and coal from Britain totaled 4,121,000 tons for the entire year. For the first three quarters EEC imported 1,202,000 tons of pig iron, steel ingot, and rolled steel from EFTA and exported 2,697,000 tons of the same products to EFTA.[40]

COMMUNIST EUROPE [41]

The mineral industries of Communist Europe (including the U.S.S.R. in Asia) went through a year of moderate economic growth, with continued stress on basic minerals and heavy industry, but with some additional branching out into light industries. However, mineral consumption for consumer goods production remained considerably lower, relatively speaking, than in any fairly industrialized country in non-Communist Europe. Overall increase in mineral output value for Communist Europe was about 6 to 7 percent over that of 1963 as compared with 10 to 14 percent annually during the late 1950's, indicating that the mineral economies had matured considerably. The U.S.S.R. remained the principal mineral producer in the area, contributing about 85 to 90 percent of the total output value in 1964.

---

[39] EFTA Reporter (Washington, D.C.). No. 116, Mar. 22, 1965, 8 pp. 1964 EFTA trade figures are provisional.

[40] Office Statistique des Communautés Européennes. Sidérurgie (Luxembourg), No. 2, 1965, p. 108.

[41] Prepared by Roman V. Sondermayer.

The U.S.S.R. and Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Rumania, as members of an organization known as CEMA (Council for Economic Mutual Assistance) or SEV (Soviet Ekonomicheskooy Vzayimopomoshchi) in Russian, continued to cooperate in economic and industrial development under the leadership of the Soviet Union. There were signs in 1964, however, that CEMA countries were tending to operate more independently than in the past vis-a-vis the U.S.S.R. Yugoslavia, though not a full member of CEMA, was increasingly active in economic cooperation with the organization and with member countries on a bilateral basis.

The CEMA countries as a whole constituted a significant economic and political bloc in world affairs. In terms of basic mineral industry, the region contributed the following approximate percentages of world totals in 1964: Aluminum 20.4; smelter copper 16.0; iron ore 27.7; pig iron 25.7; ingot steel 26.0; smelter lead 24.7; smelter zinc 20.7; cement 24.0; coal 41.9; and crude petroleum 17.1.

Of the regional totals, the U.S.S.R. accounted for more than 90 percent of the iron ore and crude oil, more than 80 percent of the aluminum and copper, more than 70 percent of the pig iron and steel, more than 60 percent of the cement, and more than 50 percent of the lead and zinc. For output of most other mineral products the dominance of the U.S.S.R. also prevailed. Thus shortages and surpluses of the U.S.S.R. dominate the regional picture.

The bulk of the area's 1964 mineral output was consumed internally, leaving only small quantities for export. Communist European mineral trade with the outside world was smaller than might be expected considering the magnitude of the mineral resources and industries. The most important factors limiting mineral trade were high domestic consumption; poor planning in raising output; inferior quality of mineral products by western standards; and political considerations in trade policy. Nonetheless, minerals and their products accounted for a sizable part of the region's total trade in 1964. Significant exports included: Crude petroleum, manganese, chromite, fertilizers, and precious metals, and to a lesser extent pig iron, steel ingots, and high-rank coals. Major imports during the year included copper metal and copper semimanufactured products, tin, tungsten, and steel rolled products. Much intra-CEMA mineral trade and mineral trade with Yugoslavia involved shipments of some of the commodities just mentioned as well as large quantities of iron ore and high-rank coals originating from the U.S.S.R. Soviet minerals were vital to the industries of CEMA countries.

The commissioning of the Druzba or "Friendship" pipeline was the outstanding development of the year; this can change the overall

European petroleum supply picture and will be of strategic importance for CEMA countries. The pipeline connects the principal oilfields of the U.S.S.R. with refineries (including some under construction) in East Germany, Poland, Czechoslovakia, and Hungary. Shipment of Soviet crude via this pipeline may mean reduced costs for refinery products and hence competition to other suppliers in the non-Communist European market.

Another major event was the commissioning of the Pavlodar and Krasnoyarsk aluminum plants, both in Siberia. When these plants reach full capacity, they may affect the world aluminum supply and undoubtedly will be of importance to the industrialization of Siberia.

Management and operation of the mineral industry in Communist Europe underwent no significant change in 1964. Mineral development, facilities, and trade continued to be directly under Government supervision, with centralized planning and direction covering all phases of activities. Private and foreign investments were not possible, but technical links between the lesser CEMA countries and West European firms increased, reflecting the need for international mineral know-how and indicating shortcomings in managing the mineral enterprises in the centrally planned economies. Many Communist European mineral industry operations showed evidences of weak organization, overemployment, and interference in managerial decisions by higher levels on the basis of considerations other than economic, all contributing in addition to other factors such as electric power shortages and delayed raw material deliveries to inefficiency and low productivity. By Soviet admission,[42] productivity of Soviet industrial workers was 40 to 50 percent that of U.S. workers. In other CEMA countries, general industrial productivity was even lower than in the U.S.S.R., except for certain economically favorable and well-organized operations, since mineral industry productivity generally was below that of combined industry.

Evaluation of the Communist European mineral enterprises depends partly on the data made public. Although information published by all of the countries is regarded as basically correct, it is seldom complete; data that might adversely reflect performance are generally not included. Also, information on reserves and capacities of mines and plants when given are provided only in terms of percentage gains from an undisclosed base. Most significant is the paucity of information on nonferrous metals which makes a complete evaluation of the area's mineral industry very difficult.

THE U.S.S.R.

Mineral and metal output of the Soviet Union increased in tonnage and variety during 1964. Soviet sources reported that output of the principal products of the Soviet mineral industry increased in 1964 compared with 1963 as follows: Steel by 6 percent, cement by 6 percent, fertilizers by 28 percent, coal by 4 percent, and crude oil by 9 percent. The mineral economy contributed about 9 percent to the gross national product of the U.S.S.R., and mineral exports were significant foreign exchange earners. Out of about 21 million workers in all industries (including 2 million technicians and engineers), 4 million were in the mineral and metallurgical industries. Approximately 80 percent were employed in heavy industry. Specialists with university degrees were employed by various mineral industries as follows: Iron and steel 35,400; coal 22,000; petroleum 9,600; construction materials 20,800.

---

[42] Narodnoye Khozyaystve SSSR v 1963 godu, Statistichesky Ezhegodnik (National Economy of the U.S.S.R. in 1963, Statistical Yearbook). Moscow, U.S.S.R, pp. 718–719.

The Soviet mineral supply was believed to be generally adequate in 1964, except for some nonferrous metals (particularly copper), steel rolled products, and high quality steels; output of many minerals was a significant part of world totals as shown in table 2. In addition to commodities shown in the table, the U.S.S.R. produced about 58 percent of world corundum production, between 40 and 50 percent of total output of platinum-group metals, and between 30 and 40 percent of world production of asbestos, chromite, and magnesite.

The U.S.S.R. remained a large exporter of mineral fuels. Data for 1964 were not available, but in 1963, mineral fuels constituted 17.7 percent of total exports of which crude oil accounted for 5.9 percent. The U.S.S.R. also exported significant amounts of manganese, chromite, pig iron, and steel during 1963–64. Principal recipients of Soviet minerals were the other CEMA countries.

Development trends in the Soviet mineral industries during 1964 included: Larger shares of total mineral output from opencast mines; greater share of ferrous and nonferrous metallurgical production by the eastern areas as a result of opening of new facilities there; more efficient use of existing metallurgical facilities and closer ties between these operations and the chemical industry; and expansion of the basic oil and gas pipeline systems in an effort to alleviate regional shortages of fuel and energy.

The most significant Soviet mineral developments occurred in the metal and fuel areas. Two aluminum plants commissioned in Siberia at Krasnoyarsk and Pavlovdar were expected to add significantly to the Soviet overall aluminum supply and permit more exports. Discovery of large copper-nickel deposits near Norilsk in northern Siberia, confirmation of large iron ore reserves in central Siberia, and the commissioning of the first blast furnace in the western Siberia Iron and Steel Works at Novokuznetsk were other highlights in the field of base metals.

Completion of a pipeline system connecting Irkutsk in Siberia with the western border of the U.S.S.R., expansion of the Mangyshlak oil and gas area, and discoveries of new oilfields in western Siberia, Belorussia, and Tashkent were the major events in fuels during 1964.

OTHER COMMUNIST EUROPEAN COUNTRIES

During 1964 the other CEMA countries and Yugoslavia had political stability, but their national economies indicated that reforms were in order. Although mineral output increased modestly in 1964 and a wide variety of minerals and semimanufactured products were produced by this group of countries, by world standards and in comparison with Soviet output, the quantities were in most cases insignificant. Most of the mineral foreign trade of these nations was with other CEMA countries. Yugoslavia was the exception and most of its mineral trade continued to be with the non-Communist world, but the share of total Yugoslav trade with CEMA countries increased in 1964.

The mineral economy of Albania was modest and only production of chromite and iron nickel ore were of some significance to the East European mineral economy. The commissioning of a copper plant at Kukesh was the most important 1964 development in Albania.

Bulgaria, with its mineral industry in development, apparently increased output of its most important products, nonferrous minerals, mostly lead, zinc, and copper, but the low rank of its coal and its lack of significant production of crude oil and natural gas made continued imports of large quantities of both liquid and solid high-quality fuels a necessity. The steel industry and other projects in Bulgaria were still under development with Soviet assistance.

Czechoslovakia, famous for coal and steel, depended on imports of iron ore and other minerals. Domestic production of minerals was inadequate to cover the needs of this developed country's industry.

East Germany's mineral economy lacked basic natural foundations for a diversified and large crude mineral production; brown coal and potash were the principal mineral products. The most significant developments included the construction of the large Schwartze Pumpe brown coal combinat near Cotobus in the eastern part of East Germany and expansion of the Werra potash plant in the central part.

During 1964 the mineral industry of Hungary remained modest, and only production of bauxite and aluminum were of some world importance. New bauxite deposits discovered in western Hungary and expansion of alumina plants at Almafusito were the most significant events pertaining to Hungary's mineral economy in 1964.

Poland, with relatively well-developed high-rank coals and zinc industries, had a 9-percent increase of industrial output over that of 1963. The leading development in the mineral industry was the commissioning of the Plock petroleum refinery, Polish terminal for the Soviet Druzba crude oil pipeline.

Rumania's petroleum production continued to be its only major contribution to the world mineral supply. In 1964 its petroleum output again ranked second to that of the U.S.S.R. output in Europe but was equal to only 5 percent of Soviet output. Large-scale efforts to develop other mineral resources and construction of a new large steel complex were in progress. Most important developments in 1964 included continued construction of the Slatina aluminum plant and the Galati steel mill. The country continued to import significant quantities of iron ore and other metals.

Yugoslavia maintained its position as one of the leading European nonferrous metal producers, particularly in terms of mine output. Although all components of the mineral industry were reasonably well balanced, the country had to import high-rank coals and sizable quantities of iron and steel semimanufactures. Important mineral developments during 1964 were in the petroleum field and included discovery of two oilfields, one in northern Croatia and the other in northern Vejvodina (Backa), reconstruction of steel plants at Smederevo in Serbia and at Zenica in Bosnia, and continued work on a new, integrated steel plant at Skopje in Macedonia.

The Mineral Industry of Albania

By Bernadette Michalski[1]

◆

ALBANIA by 1964 had measurably arrested the adverse effects caused by the termination of Soviet technical assistance programs in mid-1961. The industrial production plan for the year was marginally achieved, and industrial output value increased by 7 percent over that of 1963. The mineral industry contributed about 15 percent to the gross national product, and minerals accounted for more than half of the nation's exports by value. Principal mineral exports continued to be chromite, crude petroleum, iron-nickel ores, and blister copper.

Transportation facilities were extended in the interest of commerce. The port of Durres was under expansion, and a railroad connecting the industrial area of Rubik with the Tirana-Durres-Elbasan line was under construction.

Attempts to alleviate the void of technically trained personnel were evidenced in the establishment of a mining technical school at Prenjas and a petroleum technical school at Stalin. While the Albanians were quick to emphasize the accomplishments of all-Albanian industrial projects, such as the Kukesh copper smelter which became operational this year, mainland China underwrote most of the industrial development programs. Some Italian influence, however, was registered in the Albanian mineral economy. The Italian firm, Montecatini, was awarded the construction contract for a nitrogenous fertilizer plant at Fier, the cost of which is to be borne by development assistance funds from mainland China.

Albania was a relatively small producer of minerals with few processing facilities, its only product of world significance was chromite, of which the country produced about 7 percent of the 1964 world total. However, a variety of minerals produced, such as iron-nickel ores, copper, and petroleum, had economic importance in Albania's meager industrialization efforts, as well as strategic importance to the mineral industry of Communist countries including those of Asia.

PRODUCTION

Official Albanian 1964 mineral production statistics were not available for inclusion in this publication, but preliminary reports indicate that 1964 production goals for the Albanian mineral industry were generally achieved, including increases in coal, chromite, and blister copper output. Although the production of iron-nickel ore increased significantly over that of 1963, it did not attain the peak production level of 1962, but may have met revised targets.

---

[1] Commodity research assistant, Division of International Activities.

TABLE 1.—Albania: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [e]
Metals:					
Chromite	289,075	232,458	[r] 251,297	[r] 293,000	310,000
Copper:					
Ore	81,477	80,491	[r] 135,972	[e] [r] 140,000	150,000
Blister	944	1,289	[r] 1,860	[r] 1,870	1,950
Iron-nickel ore	255,015	358,465	[r] 425,047	[e] 300,000	350,000
Nonmetals: Cement	72,879	119,764	119,243	[r] 129,000	140,000
Mineral fuels:					
Coal thousand metric tons	291	289	301	[e] 300	330
Petroleum:					
Crude do	728	771	786	[r] 750	800
Refinery products:					
Gasoline do	54	56	48	NA	NA
Gas oil do	68	63	76	NA	NA
Diesel oil do	2	3	2	NA	NA
Unspecified do	245	263	356	NA	NA
Total do	369	385	[r] 482	[e] 480	480

[e] Estimate. [r] Revised. NA Not available.

TRADE

Minerals accounted for more than 53 percent of the value of exports in 1963. Total 1964 foreign trade turnover increased by 15 percent over that of the previous year.

The bulk of trade was conducted with Communist countries. Mainland China has generally accounted for slightly more than half of the total trade, followed by Czechoslovakia. However, trade with Italy, France, and Finland increased. Although trade agreements with the Western World covered a variety of minerals, including Albanian exports of petroleum, chromite, iron-nickel ore, bitumen, and marine salt in exchange for ferrous metal semimanufactures, mineral fertilizer, and petroleum products, actual mineral trade in 1964 was limited to exports of crude petroleum and imports of petroleum products and mineral fertilizers.

Italy remained Albania's principal Western trading partner. Total trade between the two nations amounted to $4 million in 1963, of which mineral trade accounted for a third. The agreement for 1964 covered an exchange of goods valued at $13 million. Albanian quotas for mineral exports to Italy were set at: 150,000 metric tons of crude oil, 30,000 tons of bitumen, 10,000 tons of chromite, 100,000 tons of iron-nickel ore, and 10,000 tons of marine salt. Albanian mineral import quotas from Italy were: 2,000 metric tons of steel plate and sheet, 500 tons of nonferrous metals, 1,000 tons of ferrous metals, 500 tons of steel pipe, 50 tons of steel cable, and 100 tons of aluminum foil.

Trade with European Communist nations remained relatively unchanged with continued emphasis on minerals and mineral products.

TABLE 2.—Albania: Export of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	Principal destinations, 1962
Metals:			
Chromite	233,800	269,100	Czechoslovakia 58,200; Poland 54,900; East Germany 49,100; mainland China 46,600.
Copper blister	1,304	1,569	Mainland China 791; Hungary 296; Czechoslovakia 151; East Germany 130.
Iron-nickel ore	416,700	417,300	Czechoslovakia 400,400.
Nonmetals: Bitumen (natural asphalt)	28,100	11,400	Czechoslovakia 5,600; Poland 4,000.
Mineral fuels: Petroleum:			
Crude.......thousand metric tons	[1] 290.5	[1] 272.6	Mainland China 104.7; East Germany 86.0.
Refinery products (bitumen fluxate).......thousand metric tons	168.8	136.8	Poland 34.0; Bulgaria 32.2; Czechoslovakia 28.4.

[1] Equivalent to about 1.9 million barrels in 1961 and 1.6 million barrels in 1962.

TABLE 3.—Albania: Import of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	Principal sources, 1962
Metals:			
Iron, reinforcing rods for concrete	11,042	19,317	Mainland China 12,325, Czechoslovakia 3,412, Poland 3,184.
Iron, sheet	1,301	2,257	Mainland China 1,600, Czechoslovakia 657.
Nonmetals:			
Cement	17,300	28,500	Yugoslavia 9,500, Rumania 7,000, Poland 5,000.
Sulfuric acid	472	1,229	Mainland China 1,183, Italy 46.
Mineral fuels: Coke	5,954	17,960	Mainland China 11,655, Poland 6,305.

COMMODITY REVIEW

METALS

Chromite.—Accounting for about 7 percent of the world chromite output, Albania continued to rank sixth among world producers and second to the Soviet Union among Communist producers. Albanian ore contains 38 to 45 percent chromic oxide (Cr_2O_3). Virtually all of the annual chromite production, approximately 300,000 tons, has been exported, principally to East Europe and mainland China. However, 1964 trade agreements with Italy, France, and Finland covered export of Albanian chromite. While actual trade in 1964 may not have included chromite, a future market in the West is probable.

Continued emphasis was placed on geologic exploration activities in the hope of increasing chromite reserves. Although no discoveries were reported, the Albanians claim that chromite exports will increase by 12 percent in 1965.

Copper.—The chronic copper shortage in most Communist countries prompted efforts to develop the copper industry rated in 1964 at about 2,000 tons of metal annually. After 30 months of construction, the nation's third small copper smelter, located at Kukesh Rreth, began operations in November. Albanians estimate that the smelter investment will be returned in 4 years.

An increase in blister copper exports by 42 percent or about 700 tons over that of the previous year was proposed for 1965, apparently attributed to the Kukesh Rreth smelter. This export will go to Communist countries, primarily to mainland China.

Imported Chinese and Polish coke served as fuel for the copper smelter. However, with completion of the Stalin petroleum coke plant in 1965, coke imports should diminish considerably.

A copper refinery in the area of Rubik-Lac and a copper-wire plant in Shkoder were under construction and scheduled for completion in 1965.

Iron-Nickel Ore.—The Pishkash and Cervenaka deposits continued to be Albania's principal sources of iron-nickel ore. New mines reportedly will soon be opened, apparently in Puke, Pogradec and/or Leskovik, where geologic exploration has been concentrated. Most iron-nickel ore went to Czechoslovakia for processing at Sered.

NONMETALS

Cement.—Construction of the Elbasan cement plant began in November. When completed, it will have an annual capacity of 100,000 tons, equivalent to nearly two-thirds of the 1964 output.

Fertilizers.—A nitrogenous fertilizer plant financed by mainland China and constructed by the Italian firm, Montecatini, was completed in November at Fier.

Construction of the Lac superphosphate plant continued in 1964, but there is no indication as to its capacity and anticipated operation date.

MINERAL FUELS

Coal.—Deposits are primarily lignite with small quantities of low-rank bituminous coals. All coal produced in 1964 was consumed within the country. Coke requirements were met by imports from mainland China and Poland.

Petroleum.—Only a token increase in production was inferred in 1964. Refineries were operating at capacity, and any increase in output would probably be reflected in export. An increase of 7 percent in crude exports was planned in 1965. The first stage of a petroleum coke plant at Stalin was completed. By 1965 the entire plant was to be in operation partially alleviating the need for coke imports.

Electric Power.—About half of Albania's electric energy output of nearly 300 million kilowatt-hours was hydroelectricity. The rising power output has not been sufficient to supply the nation's growing industrial needs. Construction of the Bistrice hydroelectric power station, behind plan, was rescheduled for completion in 1965; the Shkoder hydroelectric powerplant was completed in late 1964. Construction of a thermoelectric powerplant at Fier was started in November.

Construction began on two probably smaller hydroelectric powerplants in Borsh and Fushe-Vri to supply the needs of 30-odd villages; completion was scheduled for 1965.

To support expanding electric energy output, an electric-wire plant was under construction in Shkoder, scheduled for completion in 1965.

The Mineral Industry of Austria

By Justin B. Gowen[1]

◆

AUSTRIA'S output of marketable ores and minerals derived from domestic resources during 1964 showed little change from the gross tonnage reported for 1963. However, the gross output with a value of about $239 million, is estimated to have increased 6.6 percent over that of 1963. It was equivalent to about 2.8 percent of the gross national product of $8,454 million in current prices (an increase of 9.9 percent over 1963 prices).

Decreases in the output of coal and iron ore, reflecting streamlining of production in the interest of efficiency, were compensated by an increase in the output of magnesite, which staged a substantial recovery from the decline of 1962–63 and by an increase of cement and construction materials in response to a countrywide building boom.

Nonferrous metals output increased by more than 10 percent in quantity and value while iron and steel production increased by more than 8 percent remaining Austria's predominating industry.

The composition of the basic mineral industry at the end of 1963 showed only minor changes from the previous year; the industry consisted of 118 mines and quarries, 5 salt mines, 1,233 producing oil and gas wells, 6 salt and 8 magnesite processing works, 5 nonferrous metal reduction works, 2 integrated blast furnace-steelmaking works, and 3 other steel works. Mineral industry employment, excluding the metal manufacturing industry, is estimated at about 107,000 or roughly 19 percent of the industrial employment and 5 percent of the gainfully employed.

PRODUCTION

The value of mine and quarry production for the years 1960–64 are shown below:

Commodity group	Value of production (million dollars)				
	1960	1961	1962	1963	1964
Petroleum and natural gas	73.8	71.9	74.2	80.3	83.4
Stone and industrial minerals	55.1	66.2	60.0	56.4	69.1
Coal	43.8	40.3	42.3	45.6	44.4
Metallic ores	34.6	33.5	34.3	34.8	35.2
Salt and brine	6.1	6.5	6.7	7.2	7.0
Total[1]	213.4	218.4	217.5	224.3	239.1

[1] Includes oil shale to the approximate value of $100,000 or less annually.

---

[1] West Europe specialist, Division of International Activities.

TABLE 1.—Austria: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Alumina, fused	6,327	[e] 15,000	[e] 15,000	[e] 12,000	14,850
Aluminum:					
Primary	67,970	67,654	[r] 74,088	76,464	77,697
Secondary	[r] 25,044	[r] 28,500	[r] 31,880	[r] 34,736	39,241
Semimanufactures, aluminum, and aluminum alloys	30,049	30,528	31,896	30,723	31,983
Antimony:					
In concentrates	613	606	696	497	531
Crude	326	262	300	423	411
Bauxite	26,006	18,013	16,961	17,830	3,708
Cadmium ... kilograms	14,600	19,000	22,100	18,800	19,000
Copper:					
In concentrates	1,985	1,910	1,987	1,885	1,565
Copper sulfate	2,461	2,785	2,073	618	594
Electrolytic (primary)	11,761	11,833	12,869	13,050	14,642
Other refined (secondary)	2,988	3,208	2,038	2,832	2,822
Semimanufactures, copper, and copper alloys	43,944	38,892	34,800	37,480	42,482
Iron and steel:					
Iron ore (31 to 32 percent Fe) ... thousand tons	3,542	3,693	3,751	3,734	3,563
Pig iron ... do	2,232	2,262	2,118	2,106	2,204
Ferroalloys:					
Ferromolybdenum	NA	860	750	1,400	NA
Ferrotitanium	NA	250	----------	1,000	NA
Ferrotungsten	NA	1,700	1,450	1,900	NA
Ferrovanadium	NA	900	590	100	NA
Total	NA	3,710	2,790	4,400	4,508
Crude steel:					
L-D [1] ... thousand tons	1,773	1,819	1,829	1,849	1,964
Open hearth ... do	990	904	814	747	823
Electric ... do	400	378	327	351	407
Total ... do	3,163	3,101	2,970	2,947	3,194
Coils for rerolling ... do	53	78	29	28	29
Semimanufactures:					
Wire rod ... do	200	208	216	220	236
Other bars and rods ... do	370	388	388	296	403
Sections (excluding rails) ... do	59	47	47	42	48
Universals and heavy plates (plus 4.75 mm.) ... thousand tons	409	446	389	303	312
Medium plates and sheets (3 mm. to 4.75 mm.) ... thousand tons	65	74	57	58	79
Fine plates and sheets (less than 3 mm.) ... thousand tons	398	409	398	497	520
Sheet coils ... do	423	390	436	409	425
Other hoop and strip (hot rolled) ... do	107	102	108	153	194
Rails and railway track material ... do	48	55	58	54	59
Total semimanufactures ... do	2,079	2,119	2,097	2,032	2,276
Pipe (welded) and fittings ... do	39	45	47	48	62
Wire, single strand ... do	120	125	112	112	133
Cold strip ... do	46	46	41	47	55
Rough forgings ... do	59	70	65	66	76
Lead and zinc ores (wet) ... do	193	193	194	188	197
Lead:					
In ores	5,786	6,118	5,981	5,529	5,924
Recoverable in concentrates	5,224	5,489	5,312	4,993	5,195
Smelter production including secondary and antimonial	12,444	12,342	12,172	9,782	[r] 13,306
Semimanufactures including alloyed	3,588	[r] 3,732	3,624	3,634	4,064
Manganese content of iron ores	67,800	70,600	71,200	71,600	[e] 68,300
Nickel sulfate	191	180	183	209	[e] 225
Silver ... troy ounces	58,193	58,193	68,481	68,803	73,947
Tungsten concentrates (60 percent WO$_3$ basis)	220	288	290	223	105
Zinc:					
In ores	8,881	8,193	8,853	9,170	9,763
Recoverable in concentrates	6,577	6,034	6,590	7,091	7,261
Electrolytic	11,521	12,067	12,088	11,861	12,896
Fire refined	736	643	576	574	NA
Semimanufactures including alloyed	1,140	1,476	1,428	1,589	1,525

See footnotes at end of table.

TABLE 1.—Austria: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Nonmetals:					
Asbestos	60	512	456	579	----------
Barite, marketable	4,381	2,464	1,081	2,049	1,139
Cement thousand tons	2,830	3,084	3,057	3,304	3,769
Clays, refractories and their products (except magnesite):					
China clay thousand tons	323	344	336	349	368
Bentonite do	3	4	3	3	3
Illite do	----------	29	66	66	71
Other do	78	40	52	49	48
Refractory brick do	57	67	57	59	71
Building brick million pieces	940	1,016	991	1,006	1,054
Roofing tile do	53	53	52	45	39
Diatomite	4,020	5,437	4,185	3,936	3,832
Feldspar	4,646	3,970	5,056	2,110	1,629
Graphite:					
Crude	88,036	80,971	89,282	99,589	102,237
of which:					
Blast furnace additive	62,760	54,000	65,000	75,800	76,680
Foundry graphite	21,207	22,728	20,478	21,525	22,457
Finely ground	165	149	162	214	252
Gypsum and anhydrite thousand tons	663	680	684	585	568
Lime:					
For construction do	573	596	570	[r] 575	607
For agriculture do	105	115	101	113	121
Total do	678	711	671	688	728
Magnesite:					
Crude do	1,625	1,799	1,607	1,313	1,657
Sintered or dead burnt do	500	542	484	411	522
Caustic calcined do	168	182	181	170	192
Magnesite and chrome magnesite refractories thousand tons	260	295	275	223	480
Mica	144	88	15	----------	----------
Pigments (specular hematite)	3,459	3,516	3,308	4,120	4,304
Pumice (trass)	35,000	37,055	27,847	21,182	22,882
Quartz and quartzite	86,639	72,630	73,927	65,859	68,897
Quartz sand thousand tons	166	198	190	199	197
Salt:					
Rock do	2	3	5	5	1
Evaporated do	132	139	147	166	167
Other do	172	115	137	173	224
Sand, industrial do	51	57	50	47	56
Talc and soapstone	82,277	84,948	75,771	65,644	71,872
Mineral fuels:					
Coal:					
Bituminous thousand tons	132	106	99	104	103
Lignite do	5,973	5,661	5,712	6,052	5,761
Coke:					
High temperature do	[r] 1,837	1,782	1,654	[r] 1,634	1,608
Low temperature do	[r] 263	254	315	[r] 343	313
Gas, natural and liquefied petroleum gas million cubic feet [2]	[r] 51,883	[r] 54,951	[r] 57,733	[r] 59,990	61,653
Oil shale	763	551	616	325	45
Petroleum:					
Crude thousand tons	2,448	2,356	2,394	2,620	2,663
Refinery products:					
Gasoline do	282	245	353	413	514
Kerosine do	40	46	37	58	86
Gas oil do	606	638	784	845	859
Fuel oil do	817	957	1,214	1,392	1,767
Lubricants do	79	89	119	111	198
Asphalt and bitumen do	68	87	113	127	162
Other do	9	4	4	3	----------

[e] Estimate. [r] Revised. NA Not available.

[1] Linz-Donawitz oxygen process.

[2] Calculated at 15° C. and 760 mm. mercury (Hg).

TRADE

Mineral commodities again were quite prominent in Austria's overall foreign trade, accounting for 29.1 percent of all exports and 24.2 percent of all imports. A pronounced increase in mineral commodity exports in 1964 improved the Austrian trade balance in these commodities but was not sufficient to offset higher levels of imports of other commodities, and the overall trade balance thus became less favorable from Austria's viewpoint, as shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1962	377.8	1,263.3	29.9
1963	356.2	1,325.2	26.9
1964	420.8	1,444.4	29.1
Imports:			
1962	366.2	1,552.1	23.6
1963	393.7	1,675.5	23.5
1964	450.5	1,863.4	24.2
Trade balance:			
1962	+11.6	−288.8	XX
1963	−37.5	−350.3	XX
1964	−29.7	−419.0	XX

XX Not applicable.

The European Economic Community (EEC) continued to be Austria's best customer for Austria's export products, as well as the principal supplier of raw materials, accounting for 17.5 percent of the gross exports, 48.7 percent of the mineral and metal exports, 58.7 percent of the gross imports, and 48.7 percent of the mineral and metal imports. The European Free Trade Area (EFTA) was second in gross exports and imports but third in exports and imports of metals and minerals, following the Communist countries of East Europe (as a group) in these categories.

The United States and Canada accounted for 3.8 percent of the mineral and metal exports and 5.5 percent of the imports, compared with 4.7 percent of the gross exports and 5.7 percent of the gross imports.

The value of exports and imports for 1962–64 and the distribution by selected areas for 1964 is shown in table 2.

TABLE 2.—Austria: Value of mineral trade by major commodity groups[1]

(Million dollars)

Commodity group	1962 Total	1963 Total	1964						
			Europe[2]		East Europe	Other[1]	United States and Canada	Other	Total
			EEC	EFTA					
Exports:									
Metals:									
Ores and scrap	4.2	3.9	3.6	0.2	0.5	0.2	--------	0.2	4.7
Iron and steel	208.3	193.5	86.3	36.2	50.7	9.4	4.6	13.6	200.8
Nonferrous metals	42.7	42.7	25.6	10.0	5.1	2.6	2.5	3.0	48.8
Nonmetals:									
Crude	16.6	16.2	14.1	2.5	1.5	.3	1.4	1.0	20.8
Manufactures									
Fertilizers[3]	.1	.3	.1	--------	--------	--------	--------	--------	.1
Other[4]	66.2	57.6	32.0	12.5	4.1	4.4	6.9	8.1	68.0
Chemical elements and compounds[4][5]	9.5	10.9	4.7	4.8	19.8	2.6	.5	2.3	34.7
Mineral fuels and energy:									
Coal, coke and briquets	.2	.2	.1	--------	--------	--------	--------	--------	.1
Petroleum products[6]	6.4	7.1	4.1	.2	2.3	.2	--------	.5	7.3
Electric energy	23.4	23.7	29.6	1.7	--------	4.0	--------	--------	35.3
Other[7]	.2	.1	.2	--------	--------	--------	--------	--------	.2
Total	377.8	356.2	200.4	68.1	84.0	23.7	15.9	28.7	420.8
All other commodity groups	885.5	969.0	486.2	198.3	130.6	59.8	50.6	98.1	1,023.6
Total exports	1,263.3	1,325.2	686.6	266.4	214.6	83.5	66.5	126.8	1,444.4
Imports:									
Metals:									
Ores and scrap	31.3	27.5	13.4	2.3	7.4	1.3	3.4	7.8	35.6
Iron and steel	51.3	49.2	34.9	9.6	10.7	2.5	1.5	.7	59.9
Nonferrous metals	36.2	43.5	25.5	8.1	3.9	2.6	3.4	8.4	51.9
Nonmetals:									
Crude:									
Fertilizer raw materials	8.9	9.3	1.4	--------	5.2	--------	--------	4.2	10.8
Other	12.3	13.7	5.3	1.2	2.4	1.2	4.3	1.5	15.9
Manufactures:									
Fertilizers[3]	9.5	11.5	12.6	.1	1.0	--------	--------	--------	13.7
Other[4]	23.7	25.1	23.0	2.9	1.9	.4	.8	.6	29.6
Chemical elements and compounds[4][5]	46.4	49.2	46.3	5.6	5.3	2.3	5.2	4.6	69.3
Mineral fuels:									
Coal, coke and briquets	90.9	100.5	31.6	--------	59.0	.3	4.6	--------	95.5
Petroleum products[6]	54.1	62.2	30.0	3.0	25.9	5.6	.9	.1	65.5
Other[7]	1.6	2.0	1.8	1.0	--------	--------	--------	--------	2.8
Total	366.2	393.7	225.8	33.8	122.7	16.2	24.1	27.9	450.5
All other commodity groups	1,185.9	1,281.8	870.1	234.1	75.5	41.7	81.8	109.7	1,412.9
Total imports	1,552.1	1,675.5	1,095.9	267.9	198.2	57.9	105.9	137.6	1,863.4

---

[1] Groups listed are those of the Standard International Trade Classification-Revised (SITC-R) as specified in the United Nations publication, Statistical Papers, Series M, No. 34.

[2] Europe has been subdivided as follows: EEC—Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands; EFTA—Denmark, Norway, Portugal, Sweden, Switzerland, and the United Kingdom; East Europe—Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and the U.S.S.R.; Other—Finland, Greece, Yugoslavia, Spain, Turkey.

[3] Excludes nitrogenous fertilizers.

[4] Includes some commodities not covered elsewhere in the "Minerals Yearbook."

[5] Grouping as reported is not readily divisible between "Metals" and "Nonmetals."

[6] Excludes mineral tar and crude chemicals produced from petroleum.

[7] Includes peat, natural and manufactured gas, mineral tar, and crude chemicals produced from coal petroleum, and natural gas.

TABLE 3.—Austria: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Bauxite	5,048	6,855	All to West Germany.
Scrap	4,368	4,204	Italy 2,118; West Germany 2,083.
Metal and alloys:			
Unwrought	41,804	35,388	West Germany 24,546; Italy 5,046; United Kingdom 1,318; Switzerland 1,174; Czechoslovakia 1,069.
Semimanufactures	15,986	19,512	United Kingdom 2,790; Bulgaria 2,156; West Germany 1,746; Italy 1,677; Portugal 1,238; United States 1,137; undistributed 2,876.
Antimony ore and concentrate	1,136	819	Belgium-Luxembourg 747; Netherlands 21; Italy 20; West Germany 19.
Cadmium, unwrought	13	2	All to West Germany.
Chromium:			
Chromite	643	414	West Germany 369; Italy 40; United States 5.
Copper:			
Unwrought:			
Blister	217	(1)	
Refined, unalloyed	1,640	1,391	West Germany 1,011; Switzerland 330; Italy 50.
Alloys	733	1,258	Italy 732; West Germany 485; Hungary 41.
Scrap, including alloy	721	605	West Germany 300; Italy 280.
Semimanufactures including alloys	4,424	6,898	Sweden 1,554; U.S.S.R. 1,017; West Germany 509; Switzerland 444; United States 376.
Gold:			
Bullion troy ounces	5,048	3,247	West Germany 2,669; Italy 322; United Kingdom 96; Switzerland 96; Yugoslavia 64.
Other do	5,658	3,922	West Germany 3,440; Peru 257; Hungary 129; United Kingdom 64; Yugoslavia 32.
Iron and steel:			
Iron ore	30	40	West Germany 20; Switzerland 20.
Roasted pyrites	844	999	All to West Germany.
Scrap	4,498	3,440	Switzerland 1,719.
Pig iron and castings	2,202	1,039	All to Italy.
Shot, powder and sponge	349	174	West Germany 159.
Ferroalloys	2,418	2,399	NA.
Steel:			
Ingots and other primary forms. thousand tons	33	17	West Germany 9; Switzerland 6.
Coils for rerolling do	409	375	West Germany 311; Italy 28; Belgium-Luxembourg 25.
Wire rod do	50	48	Italy 18; Switzerland 14; West Germany 10; Israel 3.
Other bars, rods, sections, etc. do	106	91	Italy 16; West Germany 13; Switzerland 13; Netherlands 4; United Kingdom 4; Bulgaria 4; Rumania 4; Poland 3; United States 3.
Hoop and strip do	46	79	Switzerland 21; Italy 19; Hungary 15.
Plates and sheets			
Uncoated do	531	513	U.S.S.R. 107; West Germany 103; Czechoslovakia 45; Switzerland 42; United Kingdom 35; Poland 26; Spain 25; Italy 22.
Coated do	9	2	West Germany 1.
Wire do	31	39	Hungary 10; Italy 8; West Germany 5; Yugoslavia 3; Switzerland 3.
Railway track material do	30	25	Switzerland 23.
Pipes, tubes and fittings do	20	22	West Germany 5; Italy 3; Hungary 2; Poland 2; Switzerland 2; East Germany 2.
Lead:			
Lead oxide	617	1,055	Italy 620; Czechoslovakia 370.
Ingots and equivalent forms	2,723	[2] 1,767	Italy 1,702; West Germany 65.
Semimanufactures	23	25	Sweden 11; West Germany 4; Netherlands 4.
Magnesium, all forms	235	282	West Germany 110; United Kingdom 38; Italy 33; Netherlands 25; India 20.
Manganese oxide	157	181	West Germany 120.
Mercury 76-pound flasks	67	334	West Germany 174; Switzerland 145.

See footnotes at end of table.

TABLE 3.—Austria: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals—Continued			
Molybdenum:			
Scrap	18	33	All to West Germany.
Semimanufactures	126	130	United Kingdom 67; West Germany 19; United States 10; Netherlands 8; France 6; Italy 5; Canada 2.
Nickel:			
Matte and speiss		21	All to West Germany.
Ingots and scrap, including alloys	134	194	West Germany 189.
Semimanufactures	32	78	Yugoslavia 46; India 18; West Germany 7.
Platinum-group metals, all forms troy ounces	1,447	1,736	West Germany 804; Italy 386.
Silver:			
Bullion do	61,086	99,667	All to West Germany.
Semimanufactures do	102,882	51,441	Yugoslavia 12,860; West Germany 9,645; Netherlands 9,645; Hungary 6,430; Italy 6,430.
Tantalum:			
Scrap kilograms	300	100	All to West Germany.
Semimanufactures do	1,700	1,400	United Kingdom 500; Japan 500; France 400.
Tin:			
Oxide long tons	149	189	Czechoslovakia 173.
Metal, all forms do	18	41	Denmark 21; West Germany 11; Switzerland 2.
Tungsten:			
Ore and concentrate	322	210	All to West Germany.
Scrap	35	65	France 39; West Germany 26.
Ingots and semimanufactures	23	30	United Kingdon 6; West Germany 5; Italy 4; France 4; United States 3; Hungary 3.
Salts and compounds of uranium, thorium, and the rare earth elements.	146	158	NA.
Zinc:			
Ore and concentrate	21		
Scrap	86	872	Yugoslavia 555; West Germany 300.
Ingots and equivalent forms	3,689	2,780	Italy 2,475; West Germany 200; Yugoslavia 100.
Semimanufactures	24	25	Yugoslavia 10; Hungary 5; Italy 4; France 3.
Nonferrous ores and concentrates not elsewhere specified.	69	63	All to West Germany.
Nonferrous base metals not elsewhere specified, all forms.	19	24	Sweden 15; Switzerland 6.
Nonmetals:			
Abrasives:			
Pumice	3	11	Yugoslavia 6; Ireland 5.
Artificial corundum	9,530	12,897	NA.
Asbestos:			
Crude	160	233	West Germany 223; Sweden 10.
Products [3]	1,412	1,596	Italy 382; Spain 186; Poland 183; Sweden 138; Switzerland 121; Belgium-Luxembourg 114; France 102.
Barite and witherite		20	All to West Germany.
Cement, hydraulic	101,361	35,962	West Germany 25,928; Switzerland 9,338.
Chalk	2,870	5,028	West Germany 3,275; Czechoslovakia 758; Italy 645; Switzerland 317.
Clays and refractories:			
Bentonite	88	36	West Germany 32; Yugoslavia 4.
China clay	39,082	39,156	Italy 16,739; West Germany 9,767; Poland 6,389; Switzerland 6,036.
Fire and dinas clays	58	101	Thailand 73; East Germany 11.
Crude refractories	709	1,000	Italy 941; Switzerland 50; Thailand 9.
Other refractories	24	151	Italy 103; Czechoslovakia 21; West Germany 13.
Cryolite, natural	101	100	All to Italy.
Diatomite and other silicious earths	103	164	Hungary 58; Yugoslavia 48; Bulgaria 24; Czechoslovakia 12.
Diamond and other gem stones:			
Crude, unassorted thousand carats	550	950	All to West Germany.
Other do	60	55	Netherlands 30; West Germany 15.
Dolomite:			
Crude and sintered	14,799	17,972	West Germany 10,228; United Kingdom 2,130; Philippines 1,150; United Arab Republic (Egypt) 1,007.
Other	680	680	Greece 188; United Kingdom 110; India 110.
Feldspar	2,281	562	Switzerland 480.

See footnotes at end of table.

TABLE 3.—Austria: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Nonmetals—Continued			
Graphite	18,226	19,520	West Germany 8,692; Belgium-Luxembourg 8,151; Yugoslavia 750; Switzerland 402; Poland 398.
Gypsum, crude and sintered	39,867	49,686	West Germany 42,763; Switzerland 6,788.
Lime, slaked and hydraulic	237	182	West Germany 85; Turkey 60; Switzerland 33.
Limestone, industrial	----------	41	All to West Germany.
Magnesite:			
Crude	773	420	West Germany 246; Switzerland 112.
Sintered	188,983	164,293	West Germany 68,834; United States 45,856; Hungary 11,822; France 11,261; Italy 9,760.
Caustic calcined	96,600	94,574	West Germany 77,150; Italy 4,029; Czechoslovakia 3,477; Switzerland 2,963; Hungary 2,613.
Brick	126,241	107,097	France 17,206; West Germany 17,180; United Kingdom 10,490; Italy 10,033; Sweden 8,425; Belgium-Luxembourg 4,500; Norway 4,298; Denmark 4,095.
Other products, not burnt, including magnesite products.	108,655	90,564	West Germany 24,445; France 18,864; Italy 14,827; Rumania 6,663; United Kingdom 4,819.
Mica:			
Crude including splitting and waste	5	30	Italy 20; West Germany 10.
Products	19	8	Yugoslavia 5; Rumania 2.
Pigments, earth	2,290	2,250	West Germany 1,022; United Kingdom 622; Netherlands 210; Belgium-Luxembourg 100.
Phosphate rock, ground	----------	10	All to the United Kingdom.
Pyrites, not roasted	3,988	----------	
Quartz and quartzite	101	181	West Germany 136; Switzerland 35; Italy 10.
Salt brine	2,469	1,263	All to West Germany.
Sand:			
Quartz	909	716	West Germany 634; Czechoslovakia 60.
Other	20,266	22,248	West Germany 17,493; Switzerland 4,755.
Slate	17	15	All to West Germany.
Stone:			
Marble and other calcareous stone broken, in blocks or cut.	28,379	50,445	West Germany 49,541.
Granite and other igneous rocks broken, in blocks or cut.	45,878	78,933	West Germany 77,676.
Crushed rock, macadam, etc	444,655	324,259	West Germany 196,470; Switzerland 126,868.
Talc and soapstone	55,891	51,619	West Germany 24,972; Italy 8,674; East Germany 3,749; Switzerland 3,318; Belgium-Luxembourg 3,121; Hungary 2,216.
Vermiculite and mineral wool	93,000	86,664	West Germany 84,798; Italy 1,496.
Mineral fuels:			
Bituminous and sub-bituminous coal. thousand tons	20	20	West Germany 19.
Coke and coke breeze do	10	(1)	
High-temperature coal distillation products.	3,527	3,036	West Germany 2,457; Italy 572.
Pitch and pitch coke	1,071	2,426	East Germany 997; West Germany 556; Yugoslavia 482; Hungary 369.
Petroleum refinery products:			
Gasoline	37	53	All to Czechoslovakia.
Distillate fuel oil	194,700	205,927	Nearly all to West Germany.
Lubricants	10,953	15,176	West Germany3,078; Switzerland 2,876; Sudan 2,400; Syria 1,790.
Other	2,817	632	West Germany 303; Switzerland 199; Yugoslavia 67.
Electric energy million kilowatt hours	2,596	2,505	West Germany 2,170; Italy 174; Switzerland 161.

NA Not available.

[1] Less than ½ unit.

[2] Excludes scrap 6 tons.

[3] Excludes asbestos cement products and friction material.

TABLE 4.—Austria: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Bauxite	13,159	13,281	Surinam 11,982.
Alumina	138,009	151,619	(1).
Aluminum hydroxide	4,464	4,638	West Germany 3,580; East Germany 1,040.
Scrap	51	108	West Germany 46; Hungary 43.
Metal and alloys, unwrought	817	666	Czechoslovakia 311; West Germany 222; Switzerland 127.
Semimanufactures:			
Bars, rods, sections and wire	603	938	West Germany 385; Switzerland 303; Yugoslavia 129.
Plates, sheets and strip	443	721	West Germany 191; France 146; Netherlands 127; Switzerland 124.
Foil and thin strip	732	954	West Germany 500; Switzerland 352.
Other [2]	138	153	West Germany 86; Switzerland 34.
Antimony metal, all forms	146	268	Belgium-Luxembourg 204; West Germany 32.
Arsenic oxides and acids	33	34	East Germany 30.
Beryllium metal, all forms kilograms	----------	100	All from the United Kingdom.
Cadmium:			
Unwrought and scrap do	4,300	3,600	All from Belgium-Luxembourg.
Semimanufactures do	8,400	11,700	West Germany 11,100; Netherlands 500.
Chromium:			
Chromite	62,539	47,158	Philippines 26,290; Turkey 13,903; Iran 6,921.
Chrome oxides and hydroxides	124	123	West Germany 106.
Cobalt oxide and hydroxide. kilograms	5,300	3,000	United Kingdom 2,700.
Copper:			
Ore and concentrate	506	303	All from Italy.
Blister	4,896	5,091	Rep. of South Africa 3,614; Fed. of Central Africa 1,421.
Refined, unwrought	17,347	16,098	West Germany 13,614; Chile 822; Fed. of Central Africa 609.
Alloys unwrought including master alloys.	131	398	West Germany 329; United Kingdom 56.
Scrap	2,640	1,576	West Germany 783; Switzerland 603.
Semimanufactures, copper, and copper alloys:			
Bars, rods, angles, sections and wire.	2,032	1,325	West Germany 982; United Kingdom 123.
Plates, sheets and strip	1,057	1,329	West Germany 1,098; United Kingdom 110.
Pipes, tubes and fittings	610	627	West Germany 483; Switzerland 89.
Other (foil, powder, etc.)	175	243	Sweden 103; Netherlands 56; West Germany 53.
Gold and gold alloys:			
Bullion and other unwrought. troy ounces	964,265	754,610	United Kingdom 516,309; Switzerland 100,568; Rep. of South Africa 91,340; West Germany 45,622.
Semiwrought and wrought do	1,029	2,604	Mainly from West Germany.
Iron and steel:			
Iron ore thousand tons	1,045	989	U.S.S.R. 394; West Germany 268; Brazil 131; Sweden 73; Spain 51; Norway 36; Sierra Leone 30.
Roasted pyrites do	377	362	Italy 344; West Germany 11; Czechoslovakia 7.
Pig iron and castings do	36	97	U.S.S.R. 65; East Germany 15; West Germany 11.
Spiegeleisen do	2	2	West Germany 1; Rep. of South Africa 1.
Ferroalloys:			
Ferrochrome do	10	12	Sweden 3; Norway 2; Yugoslavaia 2; France 1; East Germany 1; Italy 1; West Germany 1.
Ferromanganese do	9	10	Norway 5; Yugoslavia 1; U.S.S.R. 1; Rep. of South Africa 1; Sweden 1.
Ferrosilicon do	8	8	Yugoslavia 1; U.S.S.R. 1; Norway 1; Sweden 1; East Germany 1; Czechoslovakia 1; Switzerland 1.
Other ferroalloys do	5	4	Norway 3.
Scrap do	42	53	West Germany 52.
Powder and sponge do	2	2	Sweden 1; West Germany 1.
Steel:			
Ingots and other primary forms. do	3	10	Rumania 8; West Germany 1.
Coils for rerolling do	18	13	Mainly from Hungary.
Wire rod do	8	2	Mainly from West Germany.

See footnotes at end of table.

TABLE 4.—Austria: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Steel—Continued			
Other bars, rods, sections, etc. ..... do	39	24	West Germany 22.
Hoop and strip ..... do	10	4	Mainly from West Germany.
Plates and sheets:			
Uncoated ..... do	15	14	West Germany 8; Belgium-Luxembourg 2; United States 1; United Kingdom 1.
Coated:			
Tinplate ..... do	13	13	France 4; Belgium-Luxembourg 4; West Germany 2; United States 1; United Kingdom 1.
Other ..... do	9	4	Belgium-Luxembourg 2; West Germany 2.
Wire ..... do	4	6	West Germany 4; Belgium-Luxembourg 1; France 1.
Railway track material ..... do	1	1	United States and West Germany.
Pipes, tubes and fittings ..... do	60	65	West Germany 42; Hungary 5; Yugoslavia 5; Italy 4; Switzerland 3; Sweden 3; United Kingdom 2.
Lead:			
Ore and concentrate	4,285	3,700	All from Italy.
Scrap	66	44	All from West Germany.
Lead, unwrought	12,850	12,901	Yugoslavia 5,473; U.S.S.R. 3,135; West Germany 1,419.
Semiwrought	236	311	West Germany 197; Yugoslavia 94.
Other manufactures	35	48	West Germany 30; United States 11.
Lead oxide	244	342	West Germany 239.
Magnesium:			
Unwrought and scrap	324	431	Italy 397.
Semiwrought and wrought products	7	15	Switzerland 8; West Germany 5; Italy 2.
Manganese:			
Ore and concentrate	14,243	692	West Germany 480; Netherlands 150.
Manganese oxides	120	139	Japan 118; West Germany 12.
Mercury ..... 76-pound flasks	806	693	Mainland China 348; U.S.S.R. 145.
Molybdenum:			
Molybdic oxides	241	296	West Germany 152; United States 134.
Metal, all forms ..... kilograms	8,700	2,200	Hungary 900; West Germany 700; Switzerland 300.
Nickel:			
Matte, speiss, etc	122	297	Canada 222; United Kingdom 36.
Nickel, unwrought	2,082	3,061	United Kingdom 1,890; Canada 656; France 400.
Nickel alloys, unwrought, and nickel scrap.	29	33	West Germany 17; United Kingdom 14.
Nickel anodes	82	102	United Kingdom 73; West Germany 23.
Semimanufactures	289	264	West Germany 175; Switzerland 45.
Platinum-group metals, all forms. ..... troy ounces	1,801	7,588	West Germany 6,559; Switzerland 675; United Kingdom 354.
Silver:			
Bullion ..... thousand troy ounces	2,189	6,086	West Germany 5,205; United Kingdom 537; Peru 322; Switzerland 22.
Semimanufactures ..... do	93	113	West Germany 74; United Kingdom 26; Switzerland 13.
Tantalum, all forms ..... kilograms	3,200	2,700	West Germany 2,500.
Tin:			
Oxide ..... long tons	2	----------	
Metal, unwrought ..... do	722	782	Netherlands 348; West Germany 116; mainland China 96; Malaysia 93; United Kingdom 92.
Semimanufactures ..... do	24	36	Switzerland 16; West Germany 13.
Titanium oxide	3,865	4,289	West Germany 3,343; United Kingdom 339; Italy 317.
Tungsten:			
Ore and concentrate	2,729	2,897	(1).
Oxides	138	214	West Germany 193; France 21.
Metal, all forms	41	45	West Germany 17; France 15; United Kingdom 12.
Salts and compounds of uranium, thorium, and the rare earth elements.	1,146	1,059	India 730; Brazil 300.
Zinc:			
Ore and concentrate	13,128	12,641	Italy 10,720; Yugoslavia 1,921.
Scrap	28	----------	
Unwrought	6,008	5,630	Poland 1,647; West Germany 1,140; U.S.S.R. 971; Bulgaria 802; Yugoslavia 785.
Semimanufactures	450	428	West Germany 357.

See footnotes at end of table.

TABLE 4.—Austria: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Other base metals, not elsewhere specified:			
Metalliferous ores and concentrates not elsewhere specified.	3,265	4,122	Australia 2,141; United States 1,436.
Scrap	----------	23	All from United States.
Metals, unwrought and wrought	301	289	Belgium-Luxembourg 130; Rep. of South Africa 56; United States 47.
Nonmetals:			
Abrasives:			
Natural:			
Dust and powder of gem stones. kilograms	10	1	Mainly from Netherlands.
Emery and corundum	126	107	Greece 71; Netherlands 29.
Pumice	406	355	Italy 263; West Germany 92.
Other crude natural	12	8	All from West Germany.
Artificial, crude or manufactured:			
Artificial corundum	2,430	2,606	West Germany 2,093; France 305.
Silicon carbide	1,143	1,490	West Germany 898; Norway 238; France 194; Switzerland 143.
Asbestos, crude	16,019	21,323	Canada 16,152; U.S.S.R. 2,117; Central African Federation 1,329; Cyprus 935.
Products of asbestos [3]	99	156	West Germany 72.
Barite and witherite	8,559	8,414	Yugoslavia 5,149; West Germany 2,644; Italy 621.
Boron salts	4,178	3,963	United States 3,272; Turkey 691.
Cement (hydraulic)	12,984	16,033	West Germany 6,183; France 3,891; Belgium-Luxembourg 2,429; Yugoslavia 1,313; Denmark 1,270.
Chalk	288	390	France 347; Switzerland 30.
Clays and refractories:			
Bentonite (not activated)	6,067	10,137	Hungary 9,892.
China clay (kaolin)	8,683	9,461	West Germany 3,811; Czechoslovakia 3,613; United Kingdom 1,670.
Fire and dinas clays	353	311	Mainly from West Germany,
Crude refractories	3,625	4,272	West Germany 2,227; Czechoslovakia 2,045.
Other refractory products	89,962	106,541	Czechoslovakia 62,877; West Germany 39,507; United Kingdom 1,420; East Germany 1,220.
Cryolite, natural	339	491	All from Denmark.
Diatomite	1,421	1,445	United States 913; West Germany 270.
Diamond and other gem stones:			
Industrial diamond thousand carats	(4)	170	West Germany 115; Japan 25; Netherlands 15; Hungary 15.
Gem stones except pearls, crude or polished, unassorted and unmounted. do	20,045	2,600	West Germany 2,155; Uruguay 255; Switzerland 120; Brazil 70.
Dolomite, crude or sintered	2,013	2,510	Italy 1,486; Norway 610; West Germany 413.
Feldspar	4,380	6,048	Yugoslavia 2,174; Italy 1,794; Sweden 1,120; West Germany 932.
Fluorspar	8,139	8,441	West Germany 5,843; Italy 1,286; East Germany 998; France 313.
Graphite, natural	219	144	West Germany 138.
Gypsum and anhydrite:			
Gypsum, crude and sintered	3,690	4,661	Poland 2,643; West Germany 2,007.
Anhydrite	14,352	8,998	Poland 8,818.
Lime, slaked and hydraulic	2,451	2,785	West Germany 2,002; Switzerland 773.
Limestone, industrial	1,512	4,806	All from West Germany.
Magnesite:			
Crude	4,243	10,792	Turkey 10,781.
Sintered	1,505	708	Greece 680; West Germany 25.
Caustic calcined	105	211	Netherlands 139; West Germany 62.
Magnesite and chrome-magnesite products.	580	160	Italy 128; West Germany 32.
Mica, including splittings and waste	234	371	Argentina 149; Norway 113; West Germany 65.
Mica products	25	20	Switzerland 16.
Pigments, earth, crude or burnt	427	315	France 168; West Germany 69; Hungary 42.
Phosphate rock	193,327	198,147	Morocco 160,679; West Germany 34,517; France 1,540; Jordan 1,411.
Phosphatic (Thomas) converter slag	273,465	321,481	France 152,598; Belgium-Luxembourg 134,428; West Germany 34,455.
Potash:			
Crude salts, natural	192,518	199,439	East Germany 172,739; U.S.S.R. 25,771; West Germany 929.
Potassium chloride	28,466	39,944	France 26,123; West Germany 10,609; U.S.S.R. 3,212.
Potassium sulfate	10,733	14,703	West Germany 13,151; East Germany 1,552.
Potassium-magnesium sulfate	39,150	40,812	All from West Germany.
Other potash salts	392	4,111	U.S.S.R. 3,846; West Germany 265.

See footnotes at end of table.

TABLE 4.—Austria: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals—Continued			
Pyrites, unroasted	30,609	24,801	Italy 11,247; Greece 9,479; U.S.S.R. 2,066; Yugoslavia 2,007.
Quartz and quartzite	10,664	11,732	West Germany 10,436; Yugoslavia 693.
Salt, including brine	103	370	Netherlands 240; West Germany 70; Yugoslavia 60.
Sand, natural:			
Quartz	93,078	101,444	West Germany 65,331; East Germany 22,042; Czechoslovakia 13,189.
Other industrial	43,974	32,137	West Germany 9,686; Czechoslovakia 7,983; Belgium-Luxembourg 7,053; Switzerland 5,082.
Slate	384	407	West Germany 376.
Stone:			
Marble and other calcareous, crude and cut.	6,144	6,227	Italy 3,399; Yugoslavia 1,539; West Germany 600.
Granite, crude and cut	8,830	10,620	Italy 4,151; Sweden 2,717; Rep. of South Africa 966; Switzerland 910.
Flint and chert	364	317	Denmark 132; West Germany 87.
Crushed rock and cuttings	61,219	100,240	West Germany 85,849; Switzerland 9,578; Italy 4,668.
Sulfur, elemental	74,105	86,146	France 24,368; United States 21,743; Poland 17,470; East Germany 11,700; U.S.S.R. 7,888.
Talc and soapstone	1,787	1,118	Italy 743; Norway 207; mainland China 80.
Trass	93	3,526	Mainly from West Germany.
Other nonmetals not elsewhere specified:			
Ceramic scrap	10,073	6,460	West Germany 5,718.
Other	17,326	19,416	West Germany 16,847; Poland 2,103.
Vermiculite and mineral wool	600	595	West Germany 475; Yugoslavia 62.
Mineral fuels:			
Coal and briquets:			
Bituminous and anthracite. thousand tons	3,678	3,991	Poland 1,432; West Germany 971; U.S.S.R. 883; United States 374; Czechoslovakia 293.
Subbituminous and lignite do	634	743	East Germany 445; West Germany 207; Yugoslavia 38; Czechoslovakia 37.
Peat do	6	7	West Germany 6.
Coke and coke breeze do	806	963	West Germany 478; Czechoslovakia 123; Hungary 98; Poland 84; U.S.S.R. 75; Italy 65.
Coal distillation products:			
Generator gas do	2	2	West Germany 1.
Coal tar do	7	3	Czechoslovakia 3.
Oils and high-temperature tars. do	6	8	West Germany 3; Poland 2; Czechoslovakia 1.
Carbon black	7,528	8,412	West Germany 2,900; Italy 2,284; Belgium-Luxembourg 1,843; United States 915.
Pitch and pitch coke thousand tons	20	17	West Germany 16.
Petroleum:			
Crude do	628	825	U.S.S.R. 461; Yugoslavia 363.
Refinery products:			
Gasoline do	535	530	Italy 386; Czechoslovakia 61; Hungary 27; U.S.S.R. 20.
Gas oil [5] do	62	70	Mainly from Italy.
Fuel oil do	890	1,024	Italy 303; Czechoslovakia 258; Hungary 221; Poland 107.
Lubricants do	39	44	Netherlands 17; West Germany 8; United States 5; France 3; Italy 3.
Liquid petroleum gas do	17	7	Czechoslovakia 3; Italy 2; West Germany 2.
Vaseline	285	277	West Germany 152; Netherlands 94; United States 29.
Paraffin and other mineral waxes.	6,065	6,734	West Germany 3,263; East Germany 1,288; Rumania 781; Hungary 417.
Petroleum pitch and petroleum coke. thousand tons	85	117	Italy 73; Hungary 28.
Asphalt and bitumin do	3	3	Trinidad 1; West Germany 1; United States 1.
Other petroleum products. do	6	116	Czechoslovakia 80; Rumania 24; Hungary 5; United States 2.
Electric energy. million kilowatt hours	89	213	Switzerland 111; Yugoslavia 61; West Germany 34; Italy 7.

---

[1] Not specified.
[2] Powder and flake; pipes, tubes, and fittings; forgings.
[3] Excludes asbestos cement products and friction material.
[4] Less than 2,500 carats.
[5] Includes kerosine: 1962—0.1; 1963—0.1.

COMMODITY REVIEW

METALS

During 1964 it was announced that additional reserves of copper ore were disclosed beyond the limits of the present ore body under exploitation at the Mitterberg mine on Hochkönig Mountain at Mühlbach near Salzburg. Reserves developed to the end of 1963 and prior to announcement of the new discovery were reported at more than 2 million tons with about 1.5 percent copper.

Consumption of the principal nonferrous metals, 1960–63 is shown below in thousand metric tons:

	1960	1961	1962	1963	1964
Aluminum, primary	47.9	37.6	34.1	41.7	46.0
Copper, refined	25.1	33.0	30.0	30.5	33.0
Lead, refined	13.7	18.8	22.1	20.1	20.6
Nickel, refined	2.8	2.7	2.1	3.1	2.8
Tin, refined	1.2	.8	1.1	.8	.6
Zinc, slab	13.8	14.1	15.2	14.8	17.2

Source: Organization for Economic Cooperation and Development. The Nonferrous Metals Industry Paris, France. 1962, pp. 47–52; 1963, pp. 11–16; 1964, pp. 5–10.

NONMETALS

Magnesite.—While the output of crude magnesite was considerably short of the 1961 peak, the production of sintered and calcined magnesite and magnesite refractories reached an alltime high maintaining their position of Austria's most important nonmetal product produced for export.

MINERAL FUELS

Petroleum.—Additions to the Schwechat refinery completed during 1964 increased the refining capacity to 4 million tons per year.

The Mineral Industry of Belgium

By F. L. Klinger[1]

❖

BELGIUM'S mineral industry continued to expand in 1964. The principal gain was a 16-percent increase in steel production, and the Belgium-Luxembourg Economic Union (BLEU) continued to be the world's foremost exporters of steel. Belgium also remained a major West European center for smelting and refining of nonferrous metals. In the European Economic Community (EEC), Belgium was the leading exporter of copper, lead, and zinc and ranked second in imports of raw copper and zinc concentrates. Belgian exports in 1964 included more than 700,000 tons of metals other than iron and steel, in addition to a wide range of mineral and metal manufactures.

The gross national product (GNP) of Belgium in 1963 was estimated at $13.8 billion,[2] with the mining industry contributing 2.2 percent; the iron, steel, and nonferrous metals industry 2.9 percent; metal manufacturing 7.4 percent, and the construction industry 6.5 percent. The index of production for each of these industries, as well as for petroleum fuels, increased in 1964 and GNP rose about 10 percent to an estimated $15.3 billion. The milder winter of 1963–64 was largely responsible for exceptional activity in the construction industry although it adversely affected sales of domestic coal. Petroleum fuels also continued to replace coal as a primary energy source and refinery production increased.

Employment in the mineral industry in 1964 was estimated at about 180,000 persons, most of whom were occupied in the coal, iron and steel, and nonferrous metal industries. An additional 227,000 were employed in metal manufacturing, 24,000 in glassmaking, and 14,000 in cement, brick, and tile manufacture.

PRODUCTION

In addition to the increased output of iron and steel, production of nonferrous metals also increased except for that of lead and tin, ores which were in short supply during 1964. Production of nonferrous semimanufactures rose by 20 percent, mainly because of aluminum and copper. Quarry production reached record levels and output of cement increased by 24 percent, as the construction industry led all other Belgian industries in productivity gains in 1964. Output of solid fuels declined slightly compared with that of 1963, while production of petroleum products increased by 10 percent. There was also a 9-percent increase in production of electric power.

---

[1] Foreign mineral specialist, Division of International Activities.

[2] Where necessary, values have been converted from Belgian francs (BF) to U.S. dollars at the rate of BF50=US$1.00.

TABLE 1.—Belgium: Production of minerals and metals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Secondary	2,772	1,860	[r] 2,842	3,547	3,500
Semimanufactures	61,600	71,700	80,700	95,500	123,500
Antimony [1]	4,596	4,620	[r] 4,811	4,418	NA
Copper:					
Refined	211,800	221,600	[r] 221,434	[r] 271,444	286,100
Semimanufactures	123,600	127,000	114,200	124,200	153,800
Sulfate [e] [2]	21,000	17,000	15,000	13,000	NA
Iron and steel:					
Iron ore ... thousand tons	160	115	80	96	61
Pig iron and ferroalloys ... do	[r] 6,520	[r] 6,459	[r] 6,773	6,958	8,122
Steel:					
Ingots and castings ... do	7,181	[r] 7,002	7,351	7,525	8,725
Semimanufactures ... do	[r] 4,954	[r] 4,935	[r] 5,499	5,769	6,475
Lead:					
Smelter, including secondary	92,705	99,890	93,151	98,433	83,300
Semimanufactures	25,600	27,400	27,800	26,800	26,000
Precious metals:					
Unworked [3] ... thousand troy ounces	12,263	13,172	12,325	12,965	NA
Semimanufactures ... do	675	634	609	609	NA
Tin:					
Smelter, including secondary ... long tons	[r] 8,563	[r] 6,372	[r] 9,505	8,280	6,791
Semimanufactures ... do	394	394	492	689	787
Titanium dioxide [e]	9,500	10,000	10,000	12,000	NA
Zinc:					
Smelter, including secondary	247,563	245,548	206,156	[r] 206,300	222,500
Semimanufactures	38,100	43,600	45,700	43,800	45,300
Nonmetals:					
Cement ... thousand tons	4,388	4,754	4,788	4,709	5,846
Clays ... do	[r] 270	[r] 258	[r] 208	[r] 187	203
Dolomite:					
Raw ... do	450	490	586	692	908
Calcined ... do	307	300	296	324	337
Fertilizer raw materials:					
Nitrogen	319,326	275,664	281,153	314,715	357,000
Phosphates	10,355	14,016	17,304	13,632	22,100
Thomas slag ... thousand tons	1,346	1,294	1,368	1,337	1,622
Feldspar	NA	NA	156	NA	NA
Flint	11,149	14,455	8,034	10,664	14,924
Lime [4] ... thousand tons	1,928	1,923	[r] 2,036	2,020	2,298
Plaster	65,900	69,800	[r] 79,900	81,600	91,200
Quarry products:					
Limestone ... thousand tons	3,779	4,849	5,320	7,344	9,899
Marble:					
In blocks ... cubic meters	4,918	5,069	5,144	5,783	7,300
Slabbed, including worked ... do	9,459	9,790	9,091	9,150	NA
Crushed and other	24,373	27,518	26,150	27,325	NA
Natural carbonates [5] ... thousand tons	419	910	876	829	1,010
Petit granite (Belgian bluestone):					
Quarried ... cubic meters	161,377	204,246	336,386	311,391	NA
Sawed ... do	57,929	62,611	64,875	59,572	NA
Worked ... do	16,476	17,008	16,339	14,457	NA
Roughstone, crushed and other ... do	195,120	270,713	314,302	289,758	NA
Porphyry:					
Paving and mosaic stone ... thousand tons	9	5	----------	----------	----------
Roughstone, including crushed ... do	3,141	3,356	4,085	4,511	NA
Quartz and quartzite	[r] 272,284	[r] 377,193	[r] 282,522	[r] 307,064	304,572
Sand and gravel:					
Construction sand ... thousand tons	2,029	2,716	3,174	3,644	5,200
Foundry sand ... do	932	975	1,039	1,178	1,379
Glass sand ... do	1,174	1,190	1,378	1,457	1,332
Other sand, including dredged ... do	1,589	1,610	1,751	2,061	NA
Gravel (dredged) ... do	3,081	3,309	3,568	4,923	NA
Sandstone:					
Roughstone including crushed ... thousand tons	1,116	1,134	1,216	1,286	NA
Paving and mosaic stone ... do	18	11	9	8	NA
Other ... do	78	81	77	80	NA
Slate, roofing and other	9,600	10,200	11,200	10,900	11,800
Whetstone	49	57	57	60	NA
Sulfur:					
Recovered	400	500	2,000	5,000	NA
Sulfuric acid, 100 percent ... thousand tons	1,423	1,350	1,232	1,236	1,348

See footnotes at end of table.

TABLE 1.—Belgium: Production of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Mineral fuels:					
Coal:					
Anthracite ....thousand tons..	5,886	5,520	5,751	5,986	6,062
Bituminous..........................do....	[r] 16,579	[r] 16,019	15,475	15,432	15,242
Briquets............................do....	[r] 1,080	[r] 1,164	[r] 1,602	[r] 2,299	1,433
Distillates [6].....................do....	271	273	282	282	NA
Coke (high temperature)..............do....	[r] 7,539	7,252	7,195	7,204	7,398
Methane (fire damp)..thousand cubic meters [7]..	69,828	70,080	70,176	70,248	NA
Petroleum refinery products:					
Aviation fuels..............thousand tons..	173	181	220	229	247
Motor gasoline......................do....	1,149	1,290	1,307	1,482	1,617
Kerosine............................do....	193	228	240	329	429
Distillate fuel oil.................do....	2,122	2,389	2,545	3,762	4,162
Residual fuel oil...................do....	2,164	2,486	2,615	3,952	4,283
Liquefied petroleum gas.............do....	110	143	176	228	252
Bitumen.............................do....	299	342	387	481	512
Lubricants..........................do....	32	28	30	31	37
Other...............................do....	276	321	435	893	1,035
Total...............................do....	6,518	7,408	7,955	11,387	12,574
Refinery fuel and loss..............do....	429	518	547	783	775

[e] Estimate. [r] Revised. NA Not available.

[1] Includes cadmium, cobalt, nickel, and other unspecified metals.

[2] Agricultural year, ending during calendar year.

[3] Silver 80 to 90 percent.

[4] Not including annual production of artificial hydraulic lime (5,000 to 6,000 tons 1960–63 and 8,600 tons in 1964).

[5] Including chalk, marl, and micaceous chalk (tuffeau).

[6] About 98 percent crude coal tar.

[7] At 0° C., 760 mm Hg, and 8,500 kilocalories per cubic meter.

TRADE [8]

Exports of metals and minerals in 1963, the latest year for which complete data were available, were valued at $1,845 million, 38 percent of exports of BLEU. Of the total value, metals (principally iron, steel, and copper) constituted 70 percent; nonmetals (principally diamonds and fertilizers) 18 percent; and mineral fuels 12 percent.

Imports of metals and minerals in 1963 were valued at $1,519 million, about 30 percent of all BLEU imports. Of this value, metals and metallic ores accounted for 43 percent, the principal commodities being iron, steel, and copper; mineral fuels (mainly crude oil and solid fuels) made up nearly 37 percent; and nonmetals (mainly diamonds and fertilizers) accounted for 20 percent.

The value of all BLEU trade increased 15 percent in 1964, both in exports and imports. Metal and mineral trade increased principally in iron and steel, copper, aluminum, crude oil, diamonds, and construction materials.

---

[8] Data on foreign trade of Belgium separate from that of Luxembourg are not available. This section covers the trade of both countries.

TABLE 2.—Belgium-Luxembourg: Exports of minerals and metals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Antimony oxide	1,271	1,155	United States 638; Netherlands 213; Italy 67.
Aluminum:			
Scrap	2,743	5,121	West Germany 2,264; France 1,013; Italy, 1,010.
Ingots	808	826	Italy 409; Netherlands 193; West Germany 94; Indonesia 64.
Semimanufactures	[1] 58,599	[1] 70,158	United States 14,298; United Kingdom 11,814; West Germany 8,782; Netherlands 8,276; Italy 4,208.
Bismuth	66	122	France 61; West Germany 51.
Cadmium	841	881	France 329; West Germany 297; Netherlands 82; United Kingdom 74.
Chromite	----------	143	NA.
Columbium kilograms	500	NA	NA.
Copper:			
Scrap	8,885	9,895	Netherlands 3,754; West Germany 2,601; France 1,564.
Refined	210,123	248,301	France 83,719; West Germany 49,872.
Semimanufactures	57,226	[1] 60,373	Netherlands 23,223; West Germany 14,695; United States 5,560.
Germanium:			
Oxide kilograms	16,200	11,700	Netherlands 7,100; Poland 1,700; Japan 1,500.
Metal do	8,800	3,800	West Germany 1,300; United Kingdom 1,100; France 1,000.
Gold, including semimanufactures. thou. troy ounces	[r] 58	55	Switzerland 26; United Kingdom 19.
Iron and steel:			
Iron ore thousand tons	237	275	France 269.
Pyrite cinder do	203	214	West Germany 198; Netherlands 13.
Scrap do	362	521	France 273; West Germany 213; Netherlands 32.
Pig iron, including cast iron, sponge and powder. do	55	140	Italy 82; France 39; West Germany 15.
Ferroalloys, including spiegeleisen. do	36	37	Italy 13; West Germany 8; United States 7; France 6.
Ingots and other primary forms. do	[r] 787	733	France 373; West Germany 175; Italy 143.
Semimanufactures [2]	6,743	6,866	West Germany 1,423; United States 1,031; France 911; Netherlands 777; Italy 372.
Lead:			
Ore and concentrate	7	----------	
Scrap	2,063	2,122	France 1,217; West Germany 510; Netherlands 275.
Pig	[r] 61,678	70,557	France 23,170; Netherlands 19,435; United States 10,226; West Germany 9,626.
Semimanufactures	7,106	6,453	Netherlands 2,425; West Germany 916; Sweden 878; United States 345.
Oxides	5,001	4,454	Netherlands 3,084; France 350; East Germany 282.
Magnesium (mainly scrap)	141	272	United States 182; United Kingdom 60.
Manganese ore	2,223	2,477	France 2,014; Italy 180.
Mercury 76-pound flasks	841	377	France 232; Netherlands 116.
Molybdenum:			
Ore [3]	62	79	United States 10.
Metal kilograms	NA	400	All to Netherlands.
Nickel:			
Unwrought (mainly scrap)	383	621	Netherlands 321; France 104; United Kingdom 64.
Semimanufactures	144	128	Netherlands 111.
Platinum and platinium-group metals (value). thousands	$539	$661	Netherlands $258; West Germany $152; France $66.
Selenium kilograms	13,400	24,500	United Kingdom 10,500; Italy 8,900; West Germany 3,300; France 2,900.
Silver:			
Ore and waste (value). thousands	$132	$282	United Kingdom $181; France $56.
Unwrought and partly worked. thou. troy ounces	[r] 8,576	10,529	West Germany 6,282; Netherlands 2,013; France 1,312.
Tantalum (value) thousands	$17	$15	NA.

See footnotes at end of table.

TABLE 2.—Belgium-Luxembourg: Exports of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals—Continued			
Tin:			
Scrap........long tons..	166	341	Netherlands 97; West Germany 84; Spain 70.
Ingot........do....	6,896	6,379	France 3,171; Netherlands 1,244; West Germany 969.
Semimanufactures........do....	296	359	Spain 275; Switzerland 25; Netherlands 23.
Oxides........do....	130	207	West Germany 106; France 41; Netherlands 36.
Titanium dioxide	10,056	6,327	Netherlands 2,810; Italy 1,009; West Germany 780.
Tungsten:			
Metal	6	7	All to Netherlands.
Oxide and hydroxide	1	11	All to Netherlands.
Uranium and thorium:			
Ore (value)........thousands..	$50	----------	
Metal........kilograms..	33,200	900	All to Italy.
Other radioactive materials........do....	7,500	10,900	Italy 7,600; France 3,200.
Zinc:			
Ore	76,875	51,118	France 16,252; West Germany 13,756; Norway 8,335; United Kingdom 6,418.
Scrap	4,096	5,835	France 4,462; Italy 1,046; West Germany 213.
Slab	111,840	122,814	West Germany 50,352; United States 14,817; France 11,318.
Dust (blue powder)	11,446	15,667	France 4,135; West Germany 2,869; Italy 2,115; Switzerland 1,283.
Semimanufactures	[r] 16,584	15,600	Netherlands 3,963; West Germany 3,860; Denmark 1,657.
Other nonferrous ore, waste, and scrap.	45,095	26,234	West Germany 21,317; Netherlands 2,309; France 1,092.
Other base metals	8,107	7,102	United States 3,832; Japan 835.
Nonmetals:			
Asbestos	121	396	West Germany 371.
Barite	23	21	NA.
Building stone:			
Marble........thousand tons..	1,131	837	Netherlands 789; West Germany 36.
Other, including worked..do....	203	168	Netherlands 142; France 6; West Germany 5.
Cement........do....	1,329	1,196	Netherlands 801; Guadeloupe 44; Ivory Coast 35; France 32.
Chalk	49,010	58,605	Netherlands 26,713; West Germany 10,809; France 8,360.
Clay	27,142	23,717	France 13,544; Netherlands 4,571; West Germany 3,800.
Diatomite	360	810	France 655; Netherlands 44; West Germany 26; Switzerland 26.
Dolomite	384,928	448,763	Netherlands 227,508; France 164,377; West Germany 35,739.
Feldspar	119	226	France 168.
Fertilizer materials:			
Nitrogenous:			
Sodium nitrate	----------	250	United Kingdom 200.
Manufactured	598	660	Mainland China 231; France 113; West Germany 62; Brazil 60.
Phosphatic:			
Phosphate rock	20,521	25,458	Netherlands 16,057; France 4,218; Switzerland 2,470.
Thomas slag....thousand tons..	[r] 1,583	1,745	France 594; West Germany 404; Netherlands 140.
Manufactured........do....	221	215	France 137; Denmark 21; Greece 15.
Potassic:			
Potassium salts	500	----------	
Manufactured....thousand tons..	1,038	1,078	United Kingdom 210; United States 205; Japan 152; Ireland 65.
Fluorspar	34	7	NA.
Graphite	41	13	Netherlands 7.
Gypsum and plasters	14,355	14,493	Netherlands 12,946.
Lime	317,238	300,564	Netherlands 236,022; France 63,665.
Limestone	613,998	716,600	Netherlands 574,364; France 138,904.
Lithium minerals	32	28	NA.
Mica	21	9	Netherlands 2.

See footnotes at end of table.

TABLE 2.—Belgium-Luxembourg: Exports of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Nonmetals—Continued			
Precious and semiprecious stones:			
Diamond:			
Industrial..thousand carats..	4,216	3,963	United States 1,167; United Kingdom 823; Netherlands 560; Israel 236.
Gem:			
Rough..........do....	138	354	United States 125; Netherlands 60; India 56; Israel 40; United Kingdom 31.
Polished..........do....	1,078	1,177	United States 481; Hong Kong 147; United Kingdom 128; West Germany 69.
Bort..........do....	1,327	3,372	United States 1,117; United Kingdom 1,062; West Germany 253.
Powder and splinters. do....	1,483	1,194	West Germany 311; Switzerland 223; Netherlands 141; Israel 138; Japan 84.
Other (value). thousand..	$1,284	$893	Switzerland $259; West Germany $174; Netherlands $165.
Quartz and quartzite..............	2,199	2,218	Netherlands 1,624; France 515.
Salt..............................	658	534	France 456; Netherlands 41; Republic of the Congo (Léopoldville) 32.
Sand, gravel and crushed stone:			
Sand..........thousand tons..	2,280	2,804	France 1,078; Netherlands 530; West Germany 332; Italy 222.
Gravel and crushed stone..do....	2,212	3,622	Netherlands 1,733; France 1,522; West Germany 364.
Sulfur..............................	9,192	8,097	Egypt 1,600; Portugal 771; Ceylon 683; Ethiopia 520.
Slag, scale, ash, etc..thousand tons..	1,765	1,829	West Germany 960; Netherlands 597; France 270.
Other mineral substances..........	126,041	57,752	Netherlands 43,292; West Germany 6,863 France 5,238.
Mineral fuels:			
Asphalt and bitumen (natural)......	48	196	West Germany 63.
Coal, including briquets. thousand tons..	[r] 3,053	2,659	France 890; West Germany 478; Netherlands 287; Switzerland 209.
Coke (from coal)..........do....	[r] 424	485	France 340; Sweden 73; Denmark 32.
Gas (from petroleum)..............	NA	49,215	France 20,911; Netherlands 19,967.
Peat, including briquets..........	240	280	France 278.
Petroleum:			
Crude..............................	1,697	1	Netherlands (including 1962).
Refinery products:			
Gasoline.....thousand tons..	431	842	United Kingdom 354; West Germany 227; Netherlands 101.
Kerosine, including white spirit. do....	174	201	Netherlands 170; Switzerland 21.
Distillate fuel oils.....do....	807	1,227	Switzerland 462; Netherlands 458; West Germany 118; France 92.
Residual fuel oils.....do....	610	1,019	Netherlands 739; France 124; Spain 45.
Lubricants..........do....	136	147	Netherlands 42; Switzerland 32.
Petroleum and wax. metric tons..	1,803	1,483	Nigeria 762; Ghana 135; Cameroon 92.
Petroleum coke.......do....	6,038	27,991	France 10,898; United Kingdom 9,566; Norway 3,589.
Bitumen and other. thousand tons..	258	326	West Germany 201; Netherlands 73; France 20; Switzerland 19.
Bunkers:			
Gasoline and kerosine. do....	8	13	XX.
Distillate fuel oil.....do....	85	87	XX.
Residual fuel oil.......do....	996	1,239	XX.
Lubricants..........do....	9	5	XX.

---

[r] Revised. NA Not available. XX Not applicable.

[1] Quantities and destinations derived from L'Economie Belge en 1964, Brussels, and from Statistical Office of European Communities (EEC), Luxembourg.

[2] Includes tubular products of iron and steel, as well as rough castings and forgings.

[3] Includes vanadium ore.

Note: Aluminum, copper, nickel, tin, zinc, etc., probably include alloys in ingots, semimanufactures, and scrap.

TABLE 3.—Belgium-Luxembourg: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Antimony:			
Oxide	145	216	Mainland China 153; United Kingdom 62.
Metal	359	242	West Germany 73; Mainland China 63; U.S.S.R. 60; France 30.
Aluminum:			
Oxide and hydroxide	9,550	10,388	West Germany 5,945; France 4,096.
Bauxite	5,512	3,251	British Guiana 2,873.
Scrap	1,804	2,352	Netherlands 995; United States 294; West Germany 286.
Ingots	68,303	89,055	France 69,227; United States 5,412; India 2,989.
Semimanufactures	16,328	16,616	West Germany 6,342; France 4,178; Netherlands 2,801.
Beryllium .... kilograms	NA	400	NA.
Bismuth	99	120	South Korea 77; United Kingdom 28.
Cadmium	161	488	Republic of the Congo (Léopoldville) 432; Netherlands 37.
Chromium:			
Chromite	456	1,031	Philippines 504.
Metal	14	72	France 32; West Germany 30; United Kingdom 9.
Cobalt oxide and hydroxide. .... kilograms	3,500	1,100	NA.
Columbium .... do	500	----------	
Copper:			
Ore	5,969	4,024	Chile, 1,815; Algeria 1,080; Czechoslovakia 311.
Scrap	32,065	36,503	France 11,389; West Germany 10,051; Netherlands 9,041.
Ingot	306,619	280,384	Republic of the Congo (Léopoldville) 176,299; United Kingdom 31,656; Peru 17,300; Republic of South Africa 14,753.
Semimanufactures	6,742	7,047	West Germany 2,693; Netherlands 2,441; France 940.
Germanium .... kilograms	17,900	17,400	Netherlands 17,000.
Gold, including semimanufactures. .... thou. troy ounces	[r] 344	318	Republic of the Congo (Léopoldville) 145; United Kingdom 145; United States 25.
Iron and steel:			
Iron ore .... thousand tons	21,145	19,720	France 14,302; Sweden 4,902.
Pyrite cinder	58,991	44,180	Spain 27,555; France 10,020; Netherlands 4,130.
Scrap	122,556	87,345	United Kingdom 33,325; Netherlands 23,435; France 16,336.
Pig iron, including cast iron, sponge powder.	432,181	476,512	France 122,148; East Germany 116,701; U.S.S.R. 83,761; West Germany 77,390.
Ferroalloys, including spiegeleisen.	105,107	104,860	France 36,929; Norway 30,052; West Germany 14,782; U.S.S.R. 6,607.
Ingots and other primary forms. .... thousand tons	263	392	Netherlands 137; West Germany 87; Japan 52; East Europe 51.
Semimanufactures .... do	523	580	West Germany 209; France 182; Netherlands 73.
Lead:			
Ore	152,062	125,605	Republic of South Africa 76,694; Canada 13,314; Bulgaria 10,736.
Oxide	1,040	997	West Germany 371; Mexico 320; France 239.
Scrap	3,578	4,052	Netherlands 2,638; France 360; West Germany 360.
Ingot	20,119	18,997	Netherlands 6,295; West Germany 3,149; United States 2,712.
Semimanufactures	642	825	Netherlands 509; West Germany 223.
Magnesium:			
Ingot	518	487	Canada 278; Norway 131; Italy 35.
Semimanufactures	40	64	United States 21; Austria 14.
Manganese:			
Ore	208,501	223,208	Republic of South Africa 123,581; Republic of the Congo (Léopoldville) 32,091; U.S.S.R. 31,444.
Oxide	548	675	Netherlands 501; West Germany 102.
Mercury .... 76-pound flasks	609	3,103	Italy 2,756; United Kingdom 145.

See footnotes at end of table.

TABLE 3.—Belgium-Luxembourg: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Molybdenum:			
Ore	8,951	2,930	Australia 1,973.
Metal, including semimanufactures.	6	9	Netherlands 6.
Nickel:			
Oxide and hydroxide	----------	31	France 8; Canada 6; Netherlands 4.
Scrap	291	409	United States 150; Netherlands 97; France 75.
Ingot	[r] 1,351	1,139	United Kingdom 931; Norway 116.
Semimanufactures	544	621	United Kingdom 211; United States 171; West Germany 95; France 90.
Platinum and related metals, including rolled. troy ounces [1]	6,430	16,075	Netherlands 6,430; other European Economic Community 9,645.
Selenium kilograms	5,700	1,300	Italy 800; Netherlands 100.
Silver:			
Ore and waste (value). thousands	$399	$1,296	United States $734; Netherlands $246.
Metal, unwrought and partly worked. thou. troy ounces [1]	7,433	6,861	West Germany 3,328; United Kingdom 1,675; Netherlands 1,128.
Tantalum kilograms	100	100	NA.
Tellurium, including arsenic	15	26	Sweden 10; United States 1.
Tin:			
Ore long tons	9,976	8,629	Republic of the Congo (Léopoldville) 6,911; Rwanda and Burundi 1,718.
Scrap do	3	45	West Germany 31.
Ingot do	1,705	2,573	Republic of the Congo (Léopoldville), 1,144; Netherlands 1,060.
Semimanufactures do	125	118	Netherlands 100.
Oxide do	16	16	West Germany 6; United Kingdom 6; France 3.
Titanium dioxide	5,512	6,500	West Germany 3,631; Japan 1,312; United Kingdom 744.
Tungsten:			
Ore	71	11	NA.
Metal, including semimanufactures.	13	17	Netherlands 16.
Uranium and thorium:			
Metal, including alloys. kilograms	200	NA	NA.
Other radioactive materials, including elements. do	8,500	22,900	United States 13,400; France 5,600; United Kingdom 3,300.
Vanadium pentoxide	444	506	Republic of South Africa 314; West Germany 190.
Zinc:			
Ore	447,516	422,826	Sweden 98,246; Finland 75,678; Republic of the Congo (Léopoldville) 65,085; Peru 51,990.
Oxide and peroxide	1,772	1,976	Netherlands 731; Poland 769; Norway 151; West Germany 105.
Scrap	1,205	412	West Germany 213; Netherlands 110.
Dust (blue powder)	113	305	West Germany 257.
Slab	35,719	24,408	Australia 9,466; Republic of the Congo (Léopoldville) 5,881; Bulgaria 3,245.
Semimanufactures	91	132	West Germany 64; United Kingdom 28; Netherlands 27.
Zirconium kilograms	21,500	NA	NA.
Other nonferrous ore, waste, and scrap.	183,415	216,499	France 54,065; West Germany 48,566; Canada 20,782.
Other metals	9,007	8,503	Republic of the Congo (Léopoldville) 7,802; West Germany 128.
Nonmetals:			
Asbestos	55,503	49,857	Canada 36,126; Republic of South Africa 7,319; U.S.S.R. 1,477.
Barite, including witherite	29,746	27,213	West Germany 17,097; Morocco 6,321; United Kingdom 1,995.
Borates, crude	134	208	United States 187.
Bromine kilograms	14,800	12,500	NA.
Building stone:			
Marble	53,633	60,026	France 31,410; Italy 14,517; Portugal 6,648; Yugoslavia 1,305.
Other, including worked	93,226	138,130	France 39,875; Netherlands 34,782; West Germany 26,950; Portugal 23,108.
Cement	32,643	38,673	France 25,893; East Germany 5,428; West Germany 2,806.
Chalk	33,195	36,315	France 20,809; Netherlands 14,408.
Clay	289,729	283,904	West Germany 138,908; United Kingdom 62,946; France 50,154.
Cryolite	136	89	Denmark 88.

See footnotes at end of table.

TABLE 3.—Belgium-Luxembourg: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals—Continued			
Diamond:			
Industrial......thousand carats..	5,604	5,148	United Kingdom 1,805; Republic of Congo (Brazzaville) 1,715; United States 581; Ghana 490; Liberia 205.
Bort and powder..........do....	2,325	3,258	United Kingdom 1,298; Republic of Congo (Brazzaville) 1,066; United States 529; Switzerland 236.
Gem:			
Rough stones..........do....	3,656	4,421	United Kingdom 3,714; United States 300; Liberia 104; France 88; Republic of Congo (Brazzaville) 80; Israel 37.
Polished..............do....	212	299	Israel 139; Republic of South Africa 56; United Kingdom 33; India 27; United States 18.
Diatomite..........................	4,485	6,455	United States 2,851; Algeria 1,811; West Germany 612.
Dolomite...........................	14,056	13,107	France 5,800; West Germany 5,092; Norway 1,854.
Earth pigments.....................	1,152	672	France 235; West Germany 170.
Feldspar, including leucite and nepheline.	32,210	25,814	France, 10,498; Sweden 6,797; Netherlands 4,150.
Fertilizer materials:			
Nitrogenous:			
Sodium nitrate..............	22,260	21,022	Chile 20,996.
Manufactured................	45,085	109,874	West Germany 54,965; France 44,657; Poland 5,064.
Phosphatic:			
Phosphate rock. thousand tons..	880	1,010	Morocco 878; U.S.S.R. 62; United States 29.
Manufactured................	7,089	825	France 546.
Potassic:			
Potassium salts.............	193,084	66,281	France 41,411; West Germany 23,127.
Manufactured..thou. tons..	1,198	1,318	France 1,045; West Germany 116; East Germany 72.
Unspecified manufactured......	39,456	44,159	West Germany 10,994; France 9,543; United Kingdom 8,421.
Fluorspar..........................	6,441	6,430	France 3,556; mainland China 1,389; East Germany 687; West Germany 615.
Graphite...........................	920	884	Austria 354; West Germany 163; France 125; Malagasy 72.
Gypsum and plasters................	354,493	356,832	France 327,883; West Germany 27,900.
Iodine, crude......................	81	117	All from Japan.
Lime...............................	47,088	52,681	France 32,444; West Germany 18,968; Netherlands 1,256.
Limestone..........................	54,298	57,148	France 56,827.
Lithium minerals...................	167	120	Netherlands 61.
Magnesite..........................	4,014	3,630	Austria 1,386; Netherlands 900; West Germany 466.
Mica...............................	891	760	United Kingdom 249; Norway 217; United States 65.
Meerschaum, including amber and jet.	5	10	Turkey 5; other West Europe 5.
Precious and semiprecious stones, natural:			
Dust and powder (value). thousands..	$659	$1,277	United States $753; United Kingdom $326.
Other (value)..............do....	$1,334	$1,504	Switzerland $644; United Kingdom $212; India $121.
Pyrite, unroasted..................	318,618	302,100	Portugal 162,940; Cyprus 54,529; Spain 38,960; U.S.S.R. 36,028.
Quartz and quartzite...............	13,305	14,756	West Germany 9,352; Norway 1,617; France 1,445.
Salt...............................	691,145	773,153	West Germany 406,813; Netherlands 269,545; France 95,753.
Sand, gravel, and crushed stone:			
Sand............thousand tons..	4,785	5,344	Netherlands 5,110; West Germany 173.
Gravel and crushed stone..do....	2,553	2,461	West Germany 1,185; Netherlands 960; France 273.
Sulfur.............................	170,302	179,688	United States 73,206; Mexico 53,743; France 41,762.
Talc and steatite..................	15,084	16,083	Norway 5,531; France 5,020; Austria 3,174; mainland China 1,064.
Other materials, not specified:			
Abrasives, natural..............	177,259	210,616	West Germany 208,874.
Slag, ashes, etc................	317,868	252,265	France 130,520; West Germany 62,152; Netherlands 59,411.
Other mineral substances.......	64,834	67,838	Netherlands 41,641; West Germany 14,039.

See footnotes at end of table.

TABLE 3.—Belgium-Luxembourg: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Mineral fuels:			
Asphalt and bitumen (natural)	2,791	4,333	Trinidad 1,186; United States 1,125; West Germany 875; Denmark 864.
Coal, including briquets. thousand tons	5,103	7,835	West Germany 2,847; United States 2,046; Netherlands, 1,181; United Kingdom 1,064; U.S.S.R. 385; France 177.
Coke (from coal) do	3,983	3,893	West Germany 3,359; Netherlands 448; United Kingdom 63.
Gas, natural do	258	263	Netherlands 135; West Germany 78; France 49.
Lignite, including briquets do	237	250	West Germany 244.
Peat, including briquets do	36	37	Netherlands 22; West Germany 14.
Petroleum:			
Crude do	8,536	12,153	Iran 3,721; Kuwait 3,504; Iraq 1,577; Venezuela 1,418; Tunisia 850; Libya 771; Lebanon 130.
Refinery products:			
Gasoline do	430	349	Netherlands 267; Netherlands Antilles 31; West Germany 25.
Kerosine, including white spirit. do	41	22	Netherlands 19; Australia 2.
Distillate fuel oils do	1,118	1,141	Venezuela 249; Netherlands 169; Bahrain 142; Netherlands Antilles 119.
Residual fuel oils do	2,310	2,203	Netherlands 1,011; Venezuela 456; U.S.S.R. 178; West Germany 124.
Lubricants do	208	218	United States 136; Netherlands 40; France 11; West Germany 10.
Petrolatum and wax do	8	8	United States 3.
Petroleum coke do	35	80	United States 70; Netherlands 6; West Germany 4.
Bitumen and other do	82	211	West Germany 43; United Kingdom 32; France 32; Venezuela 30.

r Revised. NA Not available.
[1] Calculated from quantities reported in kilograms.

TABLE 4.—Belgium-Luxembourg: Value of metals and minerals trade

(Million dollars)

Commodity	1963		1964	
	Import	Export	Import	Export
Metals:[1]				
Aluminum	57	48	74	60
Copper	191	211	229	243
Iron and steel	272	905	328	1,057
Lead	17	14	19	16
Tin	23	17	26	16
Zinc	21	37	37	56
Other	64	42	78	52
Subtotal	645	1,274	791	1,500
Nonmetals:				
Cement and lime	1	15	2	22
Diamonds:				
Industrial	41	46	46	41
Gem	180	180	218	234
Fertilizer materials:				
Crude	15	1	18	1
Manufactured	47	113	49	115
Stone,[2] sand and gravel	18	22	22	26
Other crude minerals	33	11	38	13
Subtotal	335	388	393	452
Mineral fuels:				
Coal, including briquets	140	50	134	56
Coke	74	9	88	8
Lignite and peat briquets	5	(3)	3	(3)
Petroleum:				
Crude	224	----------	238	----------
Refinery products, including gas	114	158	118	156
Subtotal	557	217	581	220
Grand total	1,537	1,879	1,765	2,172

[1] Including ores and concentrates, scrap, ingot metal and semimanufactures but not oxides or other products of the chemical industry.

[2] Including worked dimension stone.

[3] Less than ½ unit.

Source: United Nations. Commodity Trade Statistics. 1963 and 1964.

COMMODITY REVIEW

METALS

Aluminum.—Belgium continued to import bauxite for chemical and abrasive use, and production of secondary aluminum was about the same as in 1963. Imports of aluminum ingot, however, increased by 24,000 tons in 1964 as production of semimanufactures increased nearly 30 percent and exports rose by 20 percent, to 84,000 tons.

The new plant of Aluminium Europe (Aleurope) at Ghlin-Baudour was formally opened in June although the extrusion plant had started operations in September 1963. The foil products section was completed in 1964. Two American firms were participating in foil production: The Reynolds Metals Co. in partnership with Société Générale de Belgique at a plant near Mons and the Kaiser Aluminum & Chemical Corp. in partnership with Phenix Works, S.A., at Ivoz-Ramet near Liège. Compagnie Belge pour l'Industrie de l'Aluminium (Cobeal) acquired a majority interest in the Italian firm, Mineraria Montevergine, which is the owner of bauxite deposits in the Pouilles region.

TABLE 5.—Belgium: Trade in principal nonferrous metals

(Metric tons)

Commodity	1963		1964	
	Import	Export	Import	Export
Aluminum:				
Crude and refined	89,055	826	112,634	1,074
Semimanufactures	16,616	70,158	18,337	84,348
Copper:				
Ore	4,024	----------	2,176	----------
Crude and refined	280,384	248,301	321,929	249,818
Semimanufactures	7,047	60,373	8,433	82,378
Lead:				
Ore	125,605	7	101,613	600
Crude and refined	18,997	70,557	17,255	49,614
Semimanufactures	825	6,453	836	6,309
Tin:				
Ore	8,768	----------	6,666	24
Crude and refined	2,614	6,481	3,222	4,647
Semimanufactures	120	365	132	212
Zinc:				
Ore	422,826	51,113	449,520	21,037
Crude and refined	24,408	122,814	26,132	126,742
Semimanufactures	136	15,602	125	16,393
Nonferrous metal scrap [1]	251,406	66,024	372,463	82,517

[1] Includes nickel, magnesium, and metalliferous nonferrous waste.

Source: Ministère des Affaires Économiques et de l'Energie (Brussels). L'Économie Belge en 1964. 1965, p. 76.

Cobalt.—Production and consumption of cobalt reportedly increased in 1964 although statistics were not available. Greater demand for special products led to increased activity of the cobalt section at the Olen plant of Métallurgie-Hoboken.

Raw materials for cobalt production included white alloy from Union Minière du Haut Katanga (UMHK) operations in Republic of the Congo (Léopoldville); matte from the Ndola plant of Chibuluma Mines Ltd. in Rhodesia and Nyasaland, and concentrate from Morocco. Imports of cobalt from Belgium by the United States in 1963 included about 900 tons of metal and 200 tons of oxide.

Copper.—Belgium continued to be the second largest producer of refined copper in West Europe and accounted for 42 percent of EEC output. Production of refined metal increased 5 percent, of semimanufactures 24 percent, and exports of semimanufactures increased 33 percent. The Olen refinery of Métallurgie-Hoboken operated at full capacity and continued to process large quantities of raw copper from the Luilu plant of UMHK. Continuous and semicontinuous casting of billets cake was increasingly used for electrolytic as well as for phosphorus-deoxidized copper. Belgian prices for electrolytic wirebar rose from $0.645 per kilogram in January to $0.711 in December.

Iron and Steel.—After 3 years of relative stability, the levels of production, consumption, and trade of iron and steel in Belgium increased 10 to 16 percent. These developments resulted mainly from (1) modernized and expanded production facilities developed by several years of heavy investments; (2) increased EEC tariffs on imports of iron and steel from third countries; and (3) increased domestic demand. As usual, iron and steel exports were responsible for a large part of BLEU's trade surplus in minerals and metals and reached

$700 million in 1964. Belgium accounted for an estimated two-thirds of BLEU production and trade.

Output of Thomas steel, which constitutes the bulk of Belgian production, increased 10 percent as nearly all production units were using oxygen-enriched air. Output of Linz-Donawitz (LD) and Linz-Donawitz/Arbed-Centre National de Recherches Métallurgiques (LD/AC) steel increased fourfold and the demand for low-phosphorus, high-iron ores increased.

Total investment in the industry, which reached a peak of $165 million in 1963, dropped 32 percent in 1964 as most of the modernization and expansion projects neared completion. The new Sidmar LD steelworks under construction at yearend was slated to account for a large proportion of immediate future investments in the industry.

Steel industry employment increased 3 percent by yearend, to 52,133 hourly and 9,366 salaried personnel. Labor costs increased 16 percent in 1964, making a total increase of nearly 30 percent since the end of 1961.

TABLE 6.—Belgium: Investments in the iron and steel industry

(Million dollars)

	1961	1962	1963	1964
Coke	2.56	2.06	2.78	1.10
Raw material preparation	13.76	12.90	10.68	7.10
Blast furnaces	14.42	14.14	10.10	11.60
Steelworks	12.94	19.16	29.76	24.22
Rolling mills	68.34	72.24	88.96	48.16
Other	16.20	18.92	23.14	19.36
Total	128.22	139.42	165.42	111.54

Source: Groupement des Hauts Fourneaux et Aciéries Belges (Brussels). Annual reports (La Sidérurgie Belge) for 1963 and 1964.

TABLE 7.—Belgium: Average hourly labor costs in the iron and steel industry

(Dollars)

	1962	1963	1964
Direct wage	0.977	1.041	1.154
Fringe benefits	.354	.408	.469
Total	1.331	1.449	1.623

Source: Groupement des Hauts Fourneaux et Aciérics Belges (Brussels). La Sidérurgie Belge en 1964. 1965, p. 46.

Other cost problems in 1964 included the prices of coal and rail haulage of Lorraine iron ore to Belgian plants. Although U.S. coal was about $4 per ton cheaper than European coal, the latter was used to supply 88 percent of Belgian requirements as compared with 45 percent of Netherlands requirements and 5 percent of Italian requirements. Belgian coal production, largely subsidized, supplied two-thirds of the requirements. For transportation of Lorraine ore, Belgian ton-mile rail rates were reportedly 60 to 80 percent higher than those charged by French railroads. Increased efficiency in shipment handling, however, reduced the transit time from 48 to 32 hours by yearend. The Belgian Government reduced the transmission tax on iron ore destined for export products from 6 to 3 percent in 1964.

The need to reduce costs was particularly important in view of the prevailing low steel prices and the industry's dependence on export markets. Export prices, which reached new lows by the end of 1963, increased during the first half of 1964 but again declined during the last 6 months.

Iron Ore.—France and Sweden continued to supply the major part of Belgium's iron ore, although the share of each country in the total iron supply in 1964 was reduced as shipments from Liberia and Mauritania increased sharply. Iron ores from countries other than France and Luxembourg constituted 45 percent of the imported tonnage and 62 percent of the contained iron in 1964. Shipments of Lorraine ore to Belgian plants were 1.5 million tons less than in 1962.

TABLE 8.—Belgium: Receipts of iron ore in Belgian plants

(Thousand metric tons)

Source	1962		1963		1964	
	Crude ore	Iron content	Crude ore	Iron content	Crude ore	Iron content
France:						
East (Lorraine)	8,722	2,424	7,494	2,125	7,257	2,079
West	737	319	677	289	723	311
Sweden	4,301	2,527	4,979	2,908	5,493	3,253
Luxembourg	795	217	728	200	749	204
Belgium	85	27	91	30	58	20
Other countries	304	157	464	263	1,699	1,027
Total	14,944	5,671	14,433	5,815	15,979	6,894

Source: Groupement des Hauts Fourneaux et Aciéries Belges (Brussels). Annual reports (La Sidérurgie Belge) for 1962, 1963, and 1964.

Iron ore consumption in 1964 was slightly more than 16 million tons of which 41 percent was agglomerated in Belgium. Annual Belgian agglomerating plants capacity in 1964 was estimated at 7.7 million tons and was expected to be 9 million tons in 1965. S.A. Forges de la Providence installed a second Dwight-Lloyd sintering machine during 1964, and a Lurgi unit was installed at the Athus plant of S.A. Cockerill-Ougreé near the end of 1963. New plants were under construction by S.A. Forges de Clebecq and S.A. Usines Gustave Boël.

Scrap.—Iron and steel scrap consumption in 1964 was 2,059,000 tons, of which 82 percent was consumed in steelworks, 13.5 percent in blast furnaces, 4 percent in independent foundries, and 0.5 percent in rolling mills. Thomas steel facilities accounted for 48 percent of scrap consumed in steelworks; Martin steel, 25 percent; electric steel, 18 percent; and others, 9 percent. As compared with 1963, total consumption increased 200,000 tons, of which about half was imported and the rest was generated within the industry. BLEU scrap consumption, in kilograms per ton of steel produced, remained the lowest in the EEC (203 in Belgium and 178 in Luxembourg). For Thomas steel, scrap consumption increased from 90 to 110 kilograms per ton of product because of the increased use of oxygen.

Ferroalloys.—Combined production of spiegeleisen and carbon ferromanganese in Belgium increased 30 percent in 1964, to 94,000 tons.

Consumption increased slightly, to 81,000 tons, of which 2,000 tons were used in independent steel foundries and the remainder in steelworks. In August, the EEC Commission increased 1964 BLEU quotas for duty-free imports of ferrochrome from 3,000 to 5,600 tons and of ferromolybdenum from 250 to 430 tons. It was also reported that a Belgian firm would begin producing ferromolybdenum in 1965.

Belgium did not raise tariffs on ferroalloys to the Italian level as had been recommended by the EEC Commission because of previous GATT agreements made by the Benelux countries with ferroalloy suppliers, notably Norway. In July, however, the Belgian Government imposed a compensatory tax of 5 percent on ferroalloy imports. The tax was applicable to imports from the EEC as well as from third countries.

Pig Iron.—Production of pig iron was 8,028,000 tons, an increase of 16.5 percent as compared with that of 1963. This was two-thirds of BLEU production and 13.3 percent of EEC output. Production in 1964 was 91.8 percent of capacity as compared with 86.7 percent in 1963. Thomas pig iron accounted for more than 97 percent of total production. Foundry production included 69,000 tons of siliceous iron and 22,000 tons of low-phosphorus iron. Other grades included 5,000 tons of special pig and 1,000 tons of Martin iron. Total Belgian capacity in 1964 was estimated at 8.7 million tons of pig iron annually.

In September, a new 7-meter-diameter blast furnace was completed by S.A. Forges de la Providence, and the No. 4 furnace of S.A. Forges de Clebecq was refired following repairs.

Consumption of pig iron in steelmaking in BLEU plants continued to be the highest in the EEC (926 kilograms per ton of steel in Belgian and 932 kilograms in Luxembourg). Consumption of iron ore agglomerates was 745 kilograms per ton of pig iron produced as compared with 147 kilograms in 1954.

Since late 1963, S.A. Métallurgique Espérance-Longdoz has transported about 60,000 tons per month of molten pig iron by rail between the Seraing and Chertal plants, a distance of 22 kilometers. In 1964, trial shipments were started between the Chertal works and the Couillet blast furnaces of S.A. Métallurgique Hainaut-Sambre, a distance of 110 kilometers. At yearend, similar shipments were to start from Esch and Hagondange in Luxembourg, situated 248 and 303 kilometers, respectively, from Chertal.

Crude Steel.—Production of steel in 1964 increased 16 percent as compared with that of 1963. Belgian production amounted to 10.5 percent of that of the EEC and 65.6 percent of that of BLEU. Production was 87.6 percent of rated capacity as compared with 85 percent in 1963. The largest producers were S.A. Cockerill-Ougreé (2,532,000 tons) and S.A. Forges de la Providence (1,585,000 tons).

The increase in steel production was mostly due to the widespread use of oxygen in Thomas converters and the growing number of LD facilities. The LD/AC steelworks at Chertal (two 150-ton converters), operated by S.A. d'Espérance Longdoz, the 60-ton LD/AC converter of S.A. Cockerill-Ougreé, and the small LD/AC unit at the Montignies plant of S.A. Hainaut-Sambre had their first full year of production in 1964. In August, two 60-ton LD/AC converters began production at the Forges de Clebecq works. The new Seraing

TABLE 9.—Belgium: Salient iron and steel statistics

(Thousand metric tons unless otherwise specified)

	1962	1963	1964
Number of blast furnaces:			
Available units	53	53	53
In operation do	44	43	44
Pig iron production:			
Thomas	6,613	6,803	7,930
Open hearth	5	------	1
Foundry	95	75	91
Spiegeleisen and carbon ferromanganese	57	72	94
Other	4	8	5
Total pig iron [1]	6,773	6,958	8,122
Raw materials consumed in production of pig iron:			
Iron ore (direct to furnaces)	10,226	9,676	9,418
Iron ore (in agglomeration plants)	4,914	5,062	6,569
Total iron ore	15,140	14,738	15,987
Manganese ore (direct to furnaces)	153	170	235
Coke [2]	5,673	5,586	6,143
Scrap	318	327	279
Number of steelworks:			
Thomas converters:			
Available units	56	55	56
In operation do	53	51	52
Open hearth furnaces:			
Available do	21	21	21
In operation do	13	13	12
Electric furnaces:			
Available do	30	32	29
In operation do	19	17	17
LD converters (in operation) [e]	------	5	7
Steel production (crude):			
Thomas	6,370	6,574	7,206
Open hearth	507	497	446
Electric	441	291	414
LD/AC	------	136	636
Bessemer and other	34	28	22
Total steel [1]	7,351	7,525	8,725
Ingots	7,228	7,423	8,627
High carbon and alloy steel	114	102	136
Castings	119	102	98
Raw materials consumed in production of steel:			
Pig iron [3]	6,793	7,031	8,079
Scrap	1,486	1,497	1,768
Iron ore	28	29	51
Rolled steel production:			
Rails and accessories	95	64	43
Heavy sections	271	317	431
Bars and rods	2,075	2,048	2,089
Wire rod	639	722	866
Products for tubes	79	48	61
Wide plates	43	34	32
Hot rolled sheet, thickness 3 mm or more	577	533	750
Hot rolled sheet, thickness less than 3 mm	247	231	208
Cold rolled sheet, thickness less than 3 mm	1,048	1,275	1,464
Hoop and strip, including pipe strip	314	347	376
Coils (finished products)	79	119	126
Other [4]	32	31	29
Total	[r] 5,499	[r] 5,769	6,475
Galvanized sheet [5]	[r] 257	[r] 348	364
Tinplate [5]	219	226	225
Magnetic sheet [5]	42	42	41
Tube products (seamless and welded) [5]	[r] 221	[r] 235	[e] 272
Cold drawn wire (deliveries) [5]	617	630	[e] 680
Scrap consumed in independent steel foundries	102	85	78
Scrap consumed in rolling mills	21	16	12
Total employment, iron and steel industry (end of year)	[r] 59,554	59,713	61,499

[r] Revised. [e] Estimate.

[1] Detail does not add to total because of rounding.

[2] Total in blast furnaces and agglomerating plants.

[3] Including spiegeleisen and carbon ferromanganese.

[4] Includes cold-rolled sheet 3 mm or more in thickness.

[5] Not additive to rolled steel total because of duplication.

works of S.A. Cockerill-Ougreé, which includes two 180-ton oxygen converters, was expected to begin production in 1965. By 1966, LD steel was expected to comprise 30 percent of Belgium's annual production capacity and Thomas steel 60 percent. Estimated capacities in 1964 were 12 and 72 percent, respectively.

Shipments of steel from Belgian plants in 1964 totaled 7,296,000 tons,[4] of which 42 percent was destined for EEC countries, 32 percent for other countries, and the remainder for the home market. Apparent domestic consumption in 1964 increased 12 percent, to 3,066,000 tons, of which 61.5 percent was supplied by Belgian plants, 19 percent by Luxembourg, 17.5 percent by other EEC countries, and the remainder by other countries.

TABLE 10.—Belgium: Apparent consumption of iron and steel

(Thousand metric tons)

	1962	1963	1964
Ingots and other primary forms	23	32	51
Sheets and plates	624	630	742
Bars and rods	642	633	643
Wirebars	683	653	804
Hoop and strip	279	298	357
Sections	196	184	204
Tinplate	73	77	82
Galvanized sheet	19	21	26
Rails and accessories	82	61	43
Products for pipe	79	48	61
Other	34	108	53
Total	2,734	2,745	3,066

Source: Groupement des Hauts Fourneaux et Aciéries Belges (Brussels). La Sidérurgie Belge en 1964. 1965, p. 63.

Production of high-carbon and alloy steel ingots increased 33 percent in 1964, to 136,174 tons. Alloy steels made up 65 percent of production and included 82,900 tons of structural, bearing, and tool steels; 5,094 tons of stainless, and 117 tons of high-speed steel.

The volume of Belgian trade in steel ingots and other crude forms increased about 50 percent both in imports and exports. EEC countries accounted for 90 percent of the increase in volume. The BLEU accounted for 13 percent of EEC imports of these items and 28 percent of EEC exports in 1964.

Rolled Steel.—Production of rolled steel increased 12 percent in 1964. The principal factor was an increase of 405,000 tons in hot- and cold-rolled sheet, supplemented by gains of 144,000 tons in output of wire rod and 114,000 tons of heavy sections.

Imports by the BLEU of rolled steel rose 20 percent, the increase being entirely due to receipts from EEC countries. BLEU exports increased 12 percent and continued to make up 37 percent of EEC exports of rolled steel. Belgium's share of all BLEU exports of treaty steel in 1964 was 67 percent; 3,082,000 tons were shipped to EEC countries and 2,327,000 tons to other countries including 668,000 tons to the United States.

A new rolling mill for sheet 3 millimeters or more in thickness began production in 1964 at the Clebecq works. Construction of a semicontinuous wide strip mill was continued at the La Louvière works of S.A. Usines Gustave Boël; completion was scheduled for 1965. A 325-millimeter bar-and-rod mill was also under construction by Laminoirs & Usines du Ruau S.A. at Monceau-sur-Sambre. At La Croyère, S.A. Usines Gilson installed a continuous casting unit in 1964.

---

[4] Not including tubular products, cold drawn wire, forgings, or used rails.

Lead and Zinc.—Production of smelter lead dropped by 15 percent in 1964 because of scarcity of ore supplied. The last shipments of lead concentrates from the Tsumeb mine in South-West Africa, which has furnished the major part of Belgium's supply, were received in January. The supply contract was terminated because of construction of a smelter at Tsumeb. After several months of sharply reduced imports, shipments of concentrate began arriving in July from Canada (Brunswick Mining & Smelting Corp., Ltd., at Bathurst, New Brunswick). The Canadian company had been loaned $11.5 million in October 1963, by Société Générale des Minerais on behalf of Belgian smelters to help replace the supply from Tsumeb. The loan is to be repaid by 1971, with a supply contract running for 12 years from the start of production in 1964. Belgian imports of lead concentrates in 1964 decreased by 24,000 tons while exports of refined lead fell by 21,000 tons.

Imports of zinc concentrate increased in 1964. Belgian production of slab zinc rose about 8 percent and that of zinc semimanufactures about 3 percent. The principal producing companies continued to be Sociétédes Mines et Fonderies de Zinc de la Vieille-Montagne (164,000 tons in 1963 and 167,000 tons in 1962), and Compagnie des Métaux d'Overpelt-Lommel et de Corphalie (60,000 tons in 1963–64 and 59,000 tons in 1962–63). The Vieille-Montagne Co., which was a major contributor to the loan for Brunswick Mining and Smelting, increased production of wide strip at Bray.

Tin.—Output of tin dropped nearly 18 percent in 1964, apparently due to decreasing supplies of cassiterite from African sources. Imports of metal increased and exports were substantially less than in 1963. The price of tin on the Belgian market (ex-warehouse Antwerp, in lots of 1,000 kilograms) was $2.89 per kilogram in January, $4.27 in October, and $3.65 in December.

Tantalum.—In May 1964, S.A. Fansteel-Hoboken began operating a 275-kilowatt electron-beam melting furnace at its Hoboken plant for production of tantalum ingots up to 1.8 meters in length, 110 millimeters in diameter, and 280 kilograms in weight. The company, formed in 1962, also had acquired a precision rolling mill for tantalum strip and foil. High-purity foil was to be produced for electrical capacitors. Sales by the firm will be handled through Société Générale des Minerais.

Imports of tantalum concentrates from Belgium-Luxembourg by the United States had decreased from 31,896 pounds in 1962 to 2,137 pounds in 1963.

Other Metals.—Research and improvement of production facilities for germanium semiconductors was continued by Métallurgie-Hoboken, and increased demand for monocrystals was reported in 1964. UMHK output of germanium concentrate (8,271 kilograms of recoverable Ge in 1964) from the Jadotsville and Kolwezi plants in the Republic of the Congo (Léopoldville) was probably refined at Olen. Production of silicon in all forms was also increased.

In precious metals, deliveries of crude gold to the company's refinery increased from Republic of the Congo (Léopoldville), and the output of refined silver was greater. UMHK reported returns of 1.48 million ounces of silver and 900 ounces of gold from Métallurgie-Hoboken in 1964, as compared with 1.1 million and 580 ounces, respectively, in 1963.

Uranium production by Métallurgie-Hoboken was sporadic, but output of materials for enriched uranium continued. A set of fuel elements, including plutonium-enriched uranium oxide, fabricated by Métallurgie et Mécanique Nucléaires, was introduced into the BR–3 reactor at Mol and was successfully tested for 10 months. The company was also making fuel elements for other Mol reactors and was designing and fabricating elements for the new Vulcain reactor.

NONMETALS

Cement and Other Construction Materials.—Activity in residential, industrial, and public works construction in Belgium in 1964 increased by more than 20 percent as compared with that of 1963. As a result, production of construction raw materials also increased by 20 to 30 percent, and similar gains were shown in both the volume and value of trade. These conditions also led to increased output of cement, brick, and talc products as well as ceramic materials and glass. The favorable situation of the industry was partly due to the relatively mild winter of 1963–64 as compared with severe weather conditions in the first quarter of 1963.

Production of cement increased 24 percent in 1964, after a relatively stable level of production during the previous 3 years. About 80 percent of the increase in production was absorbed on the home market, with the remainder mostly exported to the Netherlands. Apparent domestic consumption was about 4.4 million tons as compared with 3.5 million in 1963. Ready-mixed concrete plants, of which about 60 have been established in Belgium since 1952, accounted for 17 percent of domestic consumption. Of total cement production, Portland cement accounted for 76 percent, metallurgical cement 19 percent, and the remainder was clinker. Average monthly employment in the industry in 1963 was 3,717. The trade surplus attributable to cement in 1964 was approximately $17 million.

Stone production, which had been severely curtailed by cold weather in the first quarter of 1963, increased 26 percent in 1964. Large increases in production were reported for all types of quarried stone except slate, and exports to northern France increased. Imports of building stone in 1964 were valued at $8.4 million while exports were valued at $7.1 million. Employment in quarries (monthly average) totaled 7,454 in 1963.

Production of sand also increased 27 percent in 1964. Exports increased 21 percent in value and 34 percent in volume. Combined value of trade in sand, gravel, and stone other than building stone showed a surplus of $6.4 million in 1964.

Total imports of construction raw materials (including clay and other refractory materials) in 1964 were valued at $29 million, compared with total exports valued at $34.1 million. Exports of stone, sand, and gravel increased by 2.5 million tons.

Diamond.—Belgian trade in rough and polished diamonds increased substantially in 1964. The value of imports increased $33 million while the export value increased by $56 million as compared with that of 1963. These figures apparently do not include diamond of industrial and other grades, which yielded a trade surplus of $4 to $5 million in 1962 and 1963.

Elimination of export controls in October 1963 led to an increase of 754,000 carats in exports of unfinished stones in the first 9 months of 1964, a fivefold increase compared with exports of the same period in 1963. Most of this quantity was destined for India and Israel. During the same period, 3.6 million carats of uncut stones were imported, of which 77 percent came from the United Kingdom (mostly Diamond Trading Co.) while 206,000 carats of polished diamonds were imported, with Israel supplying 40 percent. Exports of polished diamonds were 979,000 carats; the United States remained the principal customer followed by Hong Kong and the United Kingdom. Total Belgian production of polished stones in 1964 was 1,115,665 carats, derived from 2,908,687 carats of rough diamonds.

Syndikaat der Belgische Diamantnijverheid (SBD), the employers organization of the Belgian cutting and polishing industry, protested the relaxation of export controls, contending that this action created a shortage of rough stones on the Antwerp market and weakened the competitive position of the industry. Later in 1964 the organization severed its connections with the Diamond Office, the association of employees, labor unions, and dealers of the Belgian diamond industry.

In other developments during 1964, the minimum wage for skilled diamond workers was increased 12 percent, to $5.18 per day, not including social security and other fringe benefits. Also, a new automatic diamond-sorting machine, using an X-ray technique to sort diamonds from gravel was built by Ateliers de Construction Électriques de Charleroi.

Fertilizer Materials.—Belgium continued to produce large quantities of primary nitrogen and Thomas slag and to manufacture large quantities of fertilizers for domestic consumption and export. Fertilizers manufactured in 1963 contained 268,000 tons of nitrogen, 60,000 tons of potash, and 146,000 tons of P_2O_5, of which two-thirds was in superphosphates. An additional 192,000 tons of P_2O_5 was contained in Thomas slag. Of the Thomas slag produced in Belgium, an estimated one-third is used for fertilizer within the country and the rest is exported mainly to France and West Germany; however, large quantities of phosphate rock are annually imported from Morocco.

Belgian consumption of fertilizer, per acre of agricultural land, is the highest among OECD countries. Fertilizers consumed during the agricultural year 1962–63 included 109,000 tons of nitrogen, 115,000 tons of P_2O_5, and 154,000 tons of potash.

In 1964, imports of crude and manufactured fertilizers were valued at about $65 million ($60.4 million in 1963), while exports were valued at $115.4 million ($113 million in 1963). Imports of crude phosphates increased nearly 17 percent in 1964.

The Tetre works of Carbochimie, S.A., of Brussels began production of di-ammonium phosphate in 1964. The product contains a minimum of 66 percent plant nutrients and consists of dust-free granules of exceptionally uniform quality. The plant was reported to be one of the most modern in Europe.

Sulfur.—Production of sulfuric acid continued to increase in 1964. Domestic consumption increased 7 percent, to 1,260,000 tons, and exports increased to 133,000 tons. Imports of elemental sulfur also increased to 214,000 tons as compared with 180,000 in 1963. In 1963, 145,000 tons of sulfur was recovered as SO_2 from Belgian smelter gases, a production nearly equal to West Germany's which was the highest in Western Europe.

MINERAL FUELS

Consumption of energy in Belgium in 1964 was estimated at about 41 million tons of standard coal equivalent (SCE).[5] Coal continued to be the principal primary source, although its share of total energy consumption again declined while that of liquid fuels increased. Coal accounted for 59 percent of energy consumption in 1964, considerably more than in other EEC countries except Luxembourg, while liquid fuels accounted for 40.6 percent of consumption, as compared with 35 percent in 1963. The remainder was provided by small quantities of wood, hydroelectric power, natural (mine) gas, and nuclear energy. Total domestic energy consumption in 1964 appeared to be close to the 1963 level although there were wide divergencies in distribution by consuming sectors. Milder winter conditions led to a 26-percent drop in deliveries of coal for domestic heating, while industrial energy consumption, particularly of electricity and liquid fuels, increased about 12 percent in terms of SCE.

Net imports of fuel in 1964 exceeded 22 million tons of SCE, reportedly exceeding domestic production for the first time. An estimated 52 percent of domestic consumption was supplied by imports in 1964 as compared with 47 percent in 1963.

Coal.—Belgian coal production in 1964 was slightly less than the annual average for 1961–63. A 177,000-ton decrease in output from southern fields was partly compensated by a 73,000-ton increase from the northern (Campine) field. The Campine field continued to be the leading producer (48 percent of total production), followed by the southern fields of Charleroi (25 percent), Liège (14 percent), and Borinage-Centre (13 percent). Of the total mine-run production of about 35 million tons, 31 million tons were processed in cleaning plants yielding about 17 million tons of cleaned coal. Of the total washery input, about 45 percent was cleaned by magnetite heavy media facilities, 29 percent by jigs, 9 percent by cyclones, about 6 percent each by launders and froth flotation, and the remainder by other (mostly pneumatic) methods.

Net imports of coal decreased by 10 percent in 1964, to 4.9 million tons. The share of U.S. coal in Belgian imports was 25 percent, a decrease of 319,000 tons as compared with 1963.

---

[5] At 7,000 kilocalories per kilogram.

Domestic coal sales decreased by 1.6 million tons, while imports and exports were also reduced. Mine stocks at yearend were 1.5 million tons (about triple the quantity of a year earlier), and an equal quantity was reportedly held by consumers. Total domestic coal consumption decreased about 9 percent. Production and consumption of coal briquets decreased by about one-third.

TABLE 11.—Belgium: Deliveries of domestic and imported coal to domestic consumers

(Thousand metric tons)

Consumer	1963	1964
Coke ovens	9,660	9,732
Domestic consumers	6,794	5,040
Thermal powerplants	4,024	4,368
Consumption at mines [1]	2,293	2,235
Agglomerating plants	2,109	1,366
Cement plants	795	805
Nonferrous metal industry	279	279
Railroads	444	296
Iron and steel industry	122	109
Other	1,277	1,112
Total	[r]27,797	25,342

[r] Revised.

[1] Including deliveries to miners and mine powerplants.

The competitive position of the industry remained difficult in 1964. Belgian coal prices were the highest in the EEC and were $3 to $4 per ton higher than imported American coal. Direct hourly labor costs rose about 6 percent (to $1.10 for underground work and to $0.77 for surface work) but the total increase including fringe benefits reportedly amounted to 17 percent. Yearend employment, however, showed a slight increase—60,600 underground and 19,100 surface workers. Average productivity in the Campine field decreased from 2,097 kilograms per man-shift in 1963 to 1,980 kilograms in 1964, but in the southern fields it remained at 1,630 kilograms.[6] Decreased productivity was attributed to the increasing number of less skilled foreign workers employed; Belgian miners made up only 34 percent of underground personnel in 1964, as compared with 39 percent in 1963. Production in 1964 was also suspended at two more mines, one at Borinage and the other at Charleroi, reducing the number of active mines at yearend to an estimated 58 as compared with 120 in 1957.

Coke.—Coke supplies increased 5 percent in 1964, to about 8 million tons, of which 92 percent was produced in Belgium and the remainder imported, mainly from the Netherlands. Domestic deliveries totaled 7.2 million tons (86 percent to the iron and steel industry), while 715,000 tons was exported mostly to Luxembourg, France, and the Scandinavian countries. Coke-oven stocks at yearend totaled 162,000 tons. Consumption of coke per ton of pig iron produced declined to 701 kilograms in 1964, as compared with 757 in 1963 and 890 in 1958.

Natural and Manufactured Gas.—Production of gas for distribution in Belgium in 1964 was about 102.4 thousand million cubic feet, about

---

[6] Employment and productivity data published by Statistical Office of the EEC (Luxembourg) in Statistiques de l'Énergie, No. 4, 1965, pp. 41 and 65.

7 percent more than in 1963. About 75 percent was produced from coke manufacture and 20 percent by "gas plants" (mostly petroleum refineries); the remainder was made up of methane recovered from coal mines and other manufactured gas. About half of the volume was distributed for domestic heating.

Belgian imports of natural gas from the Netherlands' Groningen field were expected to start by the end of 1966. A 20-year contract with N.A.M. Gas Export was reportedly negotiated by yearend. About half of the anticipated imports would be used by municipalities and the rest by industrial consumers.

Petroleum.—Belgian imports of crude oil in 1964 increased 11 percent, to 13.46 million tons. More than 75 percent was obtained from Middle Eastern countries. A total of 13.36 million tons was processed by the country's six refineries, with the Antwerp plant of Société Industrielle Belge des Pétroles (SIBP) accounting for 62 percent of the total. Belgian refining capacity increased during 1964, to 15.2 million tons annually, because of the expansion of capacity at the Antwerp plant of Esso Standard Belgium from 2.35 to 3.5 million tons. A new refinery, with a capacity of about 2 million tons annually, was proposed for construction near Zeebrugge by a group of European companies.

Production of petroleum products increased 10.4 percent, to 12.57 million tons, including 11.1 million tons of energy products. The domestic consumption pattern was marked by an 18-percent use in consumption of fuel oils. Although the iron and steel industry was not a major consumer of petroleum products, consumption by this industry increased 72 percent in 1964, mainly because of increased use of fuel oil in blast furnaces (70,196 tons in 1964 as compared with 8,675 tons in 1963).

Total employment in the industry at the end of 1963 was about 10,000, including 2,350 in refineries and the remainder in products distribution. Hourly base pay for refinery workers ranged from $0.92 to $1.25.

TABLE 12.—Belgium: Deliveries of petroleum products for domestic consumption

(Thousand metric tons)

Product	1963	1964
Motor and aviation gasoline [1]	1,420	1,564
Kerosine, including jet fuel	79	76
White spirit and special gasolines	40	36
Gas and diesel oil	3,500	3,785
Residual fuel oil	3,282	4,222
Lubricants	118	128
Bitumen	200	275
Refinery gas [2]	538	541
Other [3]	573	791
Total	9,750	11,418

[1] Includes gasoline-type jet fuel.

[2] Includes liquefied and non-liquefied refinery gases.

[3] Includes petrochemical feedstocks, paraffins, waxes, and petroleum coke.

Source: Ministère des Affaires Économiques et de L'Énergie (Brussels). L'Économie Belge en 196 1965 ,p. 56.

Retail prices for gasoline in 1964 ranged from $0.57 per U.S. gallon (85 octane) to $0.61 (95 octane), each including an excise tax of about $0.34 per gallon. The cost of lamp kerosine was about $0.27 per U.S. gallon, including excise tax of $0.03 per gallon.

Net imports of petroleum products for fuel increased 364,000 tons in 1964, a rise of 51 percent compared with 1963 net imports. In the total volume of petroleum products, however, Belgium apparently became a net exporter in 1963 and remained so in 1964. As in other EEC countries, tariffs on imports of petroleum products were lowered on November 1.

Exploration.—After drilling three core holes with negative results in West Flanders, at Houtem, Steenkerke, and Stuiverskerke, the Belgium Shell Co. canceled its request for exploration rights in this area on February 19, 1964. The company also terminated drilling, at a depth of about 9,724 feet, the Rosée No. 1 well in southern Belgium, east of Seumont in the Entre-Sambre-et-Meuse area. No shows of oil or gas were found and the company renounced its exploration permit in the area. In the Campine region, exploratory work by the Petrofina Co. for Société Campinoise de Recherches et Explorations Minérales (SCREM) continued, but results were not encouraging. In the Liège area, Service Géologique de Belgique drilled a 950-meter well (Halen) near the confluence of the Gette and Démer rivers; another well, 13 kilometers east of Liège (Balland), was drilled to 1,750 meters; and a third well, 40 kilometers southeast of Liège (Grand Halleaux), was still in Cambrian strata at a depth of 8,200 feet at yearend. The Halen and Balland wells were apparently terminated in Devonian strata.

Electric Energy.—Belgium produced 20,800 million kilowatt-hours of electricity in 1964, 9 percent more than in 1963. Thermal powerplants continued to produce 99 percent of the total. The share of coal in production of electric energy decreased to 65 percent in 1964, as compared with 70 percent in 1963, and the share provided by liquid fuel increased from 21 to 25 percent during the same period. Of total domestic consumption, the iron and steel industry accounted for about 14 percent, coal mining and processing for 9 percent, the nonferrous metals industry for 3.5 percent, and petroleum refining for 0.7 percent, with the remainder consumed by other industry and household users.

The Mineral Industry of Bulgaria

By Bernadette Michalski[1]

◆

LEAD, zinc, and low-rank coal remained Bulgaria's principal mineral products in 1964. Combined brown coal and lignite output, about 3 percent of the world total, was primarily for domestic consumption, while lead and zinc outputs, about 2 percent of world output in each case, were chiefly for export markets. Chromite, copper, iron ore, manganese ore, barite, cement, diatomite, fluorspar, gypsum, pyrite, and sulfur were important domestically, but output of these commodities was 1 percent or less of world production.

Industrial expansion, underwritten by the U.S.S.R. through credit aid, foreign trade, and scientific and technical cooperation, continued to be concentrated on the metallurgical and energy industries. The development and expansion of the Lenin metallurgical plant, the Kremikovtsi metallurgical combine, the Kurdzali lead-zinc plant, the Plovdiv lead-zinc combine, the Pirdop copper combine, the Maritza Iztok power complex, and the Burgas petrochemical combine were being carried out with Soviet aid.

The national product output value was 209 million leva in 1964. The metallurgical and machine construction industry contributed 24 million leva, the fuel industry 14 million leva, and the nonferrous metal industry 10 million leva.[2]

Mineral industry investments in 1964 represented about a third of the total centralized capital investment volume, 966.7 million leva.[3] Investments included about 104 million leva in the Lenin and Kremikovtsi metallurgical combines, about 95 million leva in electric power installations, and about 78 million leva in the coal industry, the latter investment resulting in an increase of 5.5 million tons in total capacity. Expansion of construction material enterprises, particularly the cement plants at Panega, Pleven, Devnya, and Dimitrograd, absorbed an investment of 18 million leva. About 13 million leva was invested in nonferrous metallurgy, particularly at the Medet copper complex.[4] While investment in the Burgas petroleum refinery was not reported, expanded operations there reportedly resulted in achievement of 70 percent self-sufficiency in motor fuels.

PRODUCTION

Except for crude petroleum, Bulgarian mineral and metal output continued to increase steadily. Pig iron production, although surpassing the 1963 output level, was 100,000 tons short of the planned goal; steel ingots and rolled steel were each about 50,000 tons short of goals.

---

[1] Commodity research assistant, Division of International Activities.
[2] 1.27 leva equals US$1.00.
[3] Rabotnichesko Delo (Sofia). Jan. 30, 1965, p. 1.
[4] Tekhnichesko Delo (Sofia). Jan. 11, 1964, p. 1.

Lead and zinc output, however, surpassed goals set for 1964 by 2,000 and 1,600 tons, respectively.[5]

TABLE 1.—Bulgaria: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity[1]	1960	1961	1962	1963	1964
Metals:					
Copper:					
Ore, gross weight .... thousand tons	1,126	1,461	1,786	2,109	NA
Content of ore .... do	11	18	19	19	19
Concentrate (20 percent)	70,847	81,538	93,174	91,887	91,500
Blister	16,099	18,917	19,439	20,522	21,100
Electrolytic	14,044	15,013	18,287	[r] 19,797	20,600
Rolled products	9,226	10,833	11,245	12,115	NA
Iron and steel:					
Iron ore, gross weight .... thousand tons	412	418	635	655	716
Iron content of ore .... do	188	193	258	[r] 254	255
Pig iron and ferroalloys .... do	192	206	223	[r] 265	449
Steel ingots .... do	253	340	423	461	475
Rolled products .... do	193	271	330	353	363
Lead:					
Lead-zinc ore, gross weight .... do	3,046	3,457	4,239	4,189	NA
Lead content of ore	83,770	80,040	94,400	88,900	91,300
Lead concentrate (70 percent)	119,672	114,343	134,857	127,053	130,400
Refined	40,406	40,913	[r] 43,700	[r] 51,332	87,000
Manganese ore	25,000	37,000	35,000	38,000	52,000
Zinc:					
Zinc content of ore[2]	77,000	73,900	80,500	73,600	81,300
Zinc concentrate (52 percent)	112,949	106,703	120,594	111,359	123,500
Refined	16,909	22,122	51,725	[r] 56,064	58,600
Nonmetals:					
Cement:					
Portland .... thousand tons	1,509	1,676	1,825	2,120	NA
Pozzolan .... do	77	73	68	85	NA
Total .... do	1,586	1,749	1,893	[r] 2,205	2,586
Fertilizers:					
Nitrogenous, nitrogen content	83,594	87,727	94,015	100,947	NA
Phosphatic, phosphorus pentoxide content	40,853	55,764	69,640	70,571	NA
Gypsum:					
Crude .... thousand tons	120	135	117	100	NA
Calcined .... do	15	15	13	12	NA
Lime, crude .... do	430	633	695	753	828
Pyrite concentrate (42 percent)	118,510	121,707	142,303	129,933	146,800
Refractories, all types	68,000	73,300	81,200	86,300	NA
Sulfur	10,881	12,060	13,302	14,737	NA
Mineral fuels:					
Coal:					
Lignite .... thousand tons	5,356	7,035	9,480	10,461	NA
Brown .... do	10,060	9,931	9,624	9,814	NA
Bituminous .... do	409	401	439	441	[e] 408
Anthracite .... do	161	190	197	217	[e] 200
Total .... do	15,986	17,557	19,740	[r] 20,933	24,328
Coke .... do	20	20	8	128	[3] 450
Petroleum: Crude .... do	200	207	199	173	160
Refinery products:					
Gasoline .... do	NA	NA	NA	NA	[3] 287
Diesel fuel .... do	NA	NA	25	NA	[3] 470
Fuel oil .... do	65	48	42	265	[3] 936

[e] Estimate. [r] Revised. NA Not available.

[1] In addition to reported commodities Bulgaria is known to produce gold, silver, asbestos, barite, clays, and salt.

[2] For gross weight of ore, see lead entry.

[3] Planned targets.

Sources: Statisticheski Godishnik na Narodna Republika Bulgaria—1964 (Statistical Yearbook of the Peoples Republic of Bulgaria for 1964). Sofia, 1964, 607 pp. Naruchnik na Agitatora (Sofia). January 1964, pp. 42–48. Rabotnichesko Delo, (Sofia). Jan. 30, 1965.

---

[5] Naruchnik na Agitatora (Sofia). January 1964, pp. 42–48.

TRADE

Minerals and mineral products contributed about 10 percent to total Bulgarian export value in 1963. The development of metal processing facilities in Bulgaria was reflected by a 12-million-leva decline in the value of exports of metallic ores and concentrates and a 13-million-leva increase in refined metal exports.

Import of mineral products accounted for 23 percent of total imports in 1963. Ferrous metal products, Bulgaria's largest major imports class, increased by 15 million leva in 1963.

As official Bulgarian import figures are incomplete, covering only petroleum and ferrous metals, the more comprehensive figures of exports to Bulgaria from the U.S.S.R., Bulgaria's principal trade partner, have been used to indicate the general pattern of Bulgarian imports.

TABLE 2.—Bulgaria: Export of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1962	1963	Principal countries of destination, 1963
Metals:			
Iron and steel:			
Iron ore	27,952	14,322	Rumania 13,367; Hungary 955.
Steel	----------	15,500	NA.
Lead [2]	18,013	23,513	Poland 6,084; U.S.S.R. 6,054; Czechoslovakia 4,560; East Germany 2,638; West Germany 843; Rumania 830; Austria 291; Netherlands 116.
Zinc [2]	40,358	42,763	West Germany 11,926; Czechoslovakia 11,103; East Germany 4,883; Netherlands 1,187; Austria 903.
Nonmetals:			
Barite	21,500	20,800	All to U.S.S.R.
Cement	224,045	230,848	U.S.S.R. 21,656; Sudan 10,906; Pakistan 4,220; Yugoslavia 2,636; undisclosed 191,326.
Mineral fuels:			
Coal:			
Bituminous	50,520	35,870	All to Hungary.
Anthracite	1,172	----------	
Petroleum, crude	116,022	79,658	Italy 57,125; Yugoslavia 15,722; Hungary 6,811.

NA Not available.

[1] In addition to commodities listed, it is known that sizable quantities of copper concentrates are exported, but these are not reported in official Bulgarian sources.

[2] In addition, large tonnages of lead concentrates and zinc concentrates are exported but are not separately reported in Bulgarian statistics.

Source: Statisticheski Godishnik na Narodna Republika Bulgaria—1964 (Statistical Yearbook of the Peoples Republic of Bulgaria for 1964). Sofia, 1964, 607 pp.

TABLE 3.—Bulgaria: Imports of selected metals and minerals from the Soviet Union

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:		
Aluminum:		
Ingots	1,500	2,000
Rolled products	1,634	1,589
Copper: Semimanufactured products	1,246	1,445
Iron and steel:		
Iron ore	25,000	211,000
Pig iron	113,500	132,800
Ferroalloys	4,700	5,100
Pipes	19,100	24,100
Rolled products	[r] 234,600	253,900
Tin, metal ... long tons	69	----------
Nonmetals:		
Asbestos	12,000	10,600
Apatite concentrate	117,400	138,100
Superphosphates	27,900	30,700
Graphite	700	1,200
Mineral fuels:		
Bituminous coal	932,000	1,283,000
Coke, metallurgical	106,000	139,000
Petroleum:		
Crude	----------	464,300
Refinery products:		
Gasoline ... thousand tons	386	408
Kerosine ... do	23	18
Diesel fuel ... do	446	408
Heating oil ... do	653	747
Lubricants ... do	38	38
Bitumen ... do	16	15
Paraffin ... do	2	2
Total ... do	1,564	1,636

[r] Revised.

Source: Vneshnyaya Torgovlya S.S.S.R. za 1963 god (Foreign Trade of the U.S.S.R. for 1963), Moscow, 264 pp.

COMMODITY REVIEW

METALS

Iron and Steel.—Bulgarian domestic production in recent years has satisfied about 35 percent of the country's requirement for ferrous metallurgical products. Expansion of the Lenin iron and steel combine and the development of the Kremikovtsi combine should result in increased domestic coverage of demands by 1970.

The Lenin iron and steel combine at Pernik continued as Bulgaria's principal ferrous metal producer. The seventh and largest (140-ton) Siemens-Martin furnace was fired in April. Total plant capacity was reported at 110,000 tons of steel annually. By midyear construction was completed on the first rolled-shaped division, and by yearend a rolled-sheet division with an annual capacity of 220,000 tons was installed.

Construction on the Kremikovtsi metallurgical combine continued to employ 20,000 workers. The iron ore mine was expanded to a capacity of 1.3 million tons annually; however, iron ore production in 1964 fell far short of anticipated goals.[6] The ore preparation complex, including the beneficiation installation with a 24-hour capacity of 1,800 tons of ore, was completed. Also completed by yearend were the agglomeration plant with annual capacity of 960,000 tons of agglomerate and a second coke oven battery of 395,000 tons annual capacity in the Kremikovtsi coke chemical plant.[7] Although the single operating blast furnace at Kremikovtsi had a rated annual capacity of 560,000 tons, and although it was officially reported to be in production in November 1963, the output goal for the furnace for 1964 was set at only 75,000 tons.[8] Reasons for operation at considerably less than capacity were not given.

---

[6] Vecherni Novini (Sofia). Apr. 3, 1964, pp. 1–2.

Nonferrous Metals.—Concentrated expansion and development efforts continued in the nonferrous metals industry during 1964, resulting in increased production and a larger export potential.

The Plovdiv lead-zinc smelter operated above capacity, yielding 35,000 tons of zinc and 46,000 tons of lead, or about one-half of total Bulgarian output of these metals in 1964. The Plovdiv smelter was being expanded to increase annual capacity for lead to 60,000 tons and for zinc to 55,000 tons.

At yearend the first stage of the Medet copper ore enrichment plant was completed. The flotation plant includes at least two ore crushers of 240-ton capacity each and five 150-ton grinding mills. The hydrosection includes six pumping houses and two dams. Topolnitsa River water is pumped to a height of 450 meters to be fed into the plant which consumes some 100,000 cubic meters daily.[9] Annual production at the plant is to include 153,00 tons of copper concentrate, 500 tons of molybdenum-calcium concentrate, 55,000 tons of pyrite concentrate, and 50,000 tons of feldspar concentrate.[10]

Development continued at the Medet open pit copper mine. Annual ore capacity upon completion of present work will be 4 million tons, to be later expanded to 8 million tons. Output in 1964 was about 800,000 tons. Bulgarian sources estimate Medet industrial worker productivity to be 4,050 tons of ore annually, compared with the 1964 level of 282 tons of ore annually at the Burgas subsurface copper mine.

The Damyanov copper combine at Pirdop was under expansion to facilitate the refining of the Medet copper concentrate. The capacity of the electrolytic division was to be expanded to 55,000 tons, and sulfuric acid capacity increased from 40,000 tons to 80,000 tons.

To achieve greater trace metal recovery, new processes were adopted at several nonferrous metal plants. The Rosen copper plant at Burgas was enlarged and equipped for the recovery of molybdenum concentrates. Facilities for extraction of selenium, platinum, and iridium from copper concentrates were expanded at the Damyanov combine at Pirdop. A new cyanide process was introduced at the Chelopeck plant for increased recovery of gold and silver. A bismuth extraction unit with an 8-ton annual capacity was opened at the Kurdzali lead-zinc plant in April.

---

[7] Zemedelsko Zname (Sofia). Jan. 30, 1965, p. 2.
[8] Trud (Sofia). Nov. 4, 1964, p. 3.
[9] U.S. Legation, Sofia, Bulgaria. State Department Dispatch A-244, Jan. 7, 1965.
[10] Naradna Mladezh, Sofia. Dec. 30, 1965.

NONMETALS

Cement.—In hope of increasing export capability, cement industry facilities were under expansion and development. Construction began on a new cement plant at Zlatna Planina. Plans call for an annual capacity of 500,000 tons by 1966; a final capacity of 100,000 tons was scheduled to be attained in 1968.

A fourth oven was added to the Vulcan plant in 1964, increasing cement output by 180,000 tons per year to a total plant capacity of 730,000 tons annually.

Facilities of the Zaimov plant in Pleven have been expanded to produce 600,000 tons of high-grade cement per year.

Total annual Bulgarian cement capacity approached 3 million tons in 1964.

Fertilizers.—Highly dependent upon imported mineral fertilizers in the past and through 1964, the Bulgarians planned to attain self-sufficiency in nitrogenous fertilizer by 1970. Soviet assistance was accepted in expanding the fertilizer production facilities at the Dimitrovgrad chemical combine and the Stara Zagora nitrogenous fertilizer plant. In 1964 an agreement was concluded with the U.S.S.R. for technical and financial assistance in construction of a nitrogenous fertilizer plant at Pleven.

The raw material base for nitrogenous fertilizer production in Bulgaria was being converted from Maritza basin lignite to natural gas and fuel oils. Modernization of production facilities at the Dimitrovgrad plant will permit complete conversion from lignite fuel to fuel oil by 1966.

Sulfuric Acid.—The Dimitrovgrad chemical plant and the nonferrous metal plants at Pirdop, Kurdzali, and Plovdiv manufactured approximately 325,000 tons of sulfuric acid in 1964. Long-range Bulgarian plans provide for expanded production to cover all sulfuric acid needs of the country.

MINERAL FUELS

Coal.—Bulgaria's lignite reserves were reported to total 5 billion tons, but the Nation remained deficient in bituminous and anthracite coal, relying on imports to fill industrial demand. Only one anthracite mine, at Svogen, was known to be in operation. At yearend a beneficiation plant for treatment of Svogen coals was completed. The plant's annual coal enrichment capacity was 150,000 tons, and screening capacity was 300,000 tons. Output will be directed to the Kremikovtsi metallurgical combine and the cellulose plant at Bukovtsi.

Mining was centered principally at the Maritza-Iztok lignite basin where completion of seven mines planned by 1980 will make annual output of the complex 50 million tons of lignite. Output of 2 million tons of coal briquets and 24 billion kilowatt-hours of electric power annually from the lignite also was planned, but expansion of Bulgarian power output, even to this extent, will be inadequate for anticipated industrial demand, necessitating transmission of electric power from other Communist nations.

Petroleum and Natural Gas.—The Burgas petroleum refinery commissioned in late 1963 processed about 1.5 million tons of crude petroleum, largely imported, in 1964. Losses at the refinery were reportedly cut from 2.5 percent to 2 percent by yearend. The catalytic cracking unit went into operation in August with an anticipated output of better than 100,000 tons of high-octane gasoline in 1964. Reportedly, the Burgas refinery supplied nearly 70 percent of Bulgarian gasoline, jet fuel, diesel fuels, and fuel oil requirements in 1964.[11] Construction of facilities for production of ethylene and polyethylene at Burgas was accelerated, with production anticipated in 1965.

Exploration continued in the Vratsa area in hope of discovering further natural gas deposits. During the year a gas pipeline 15 kilometers in length was laid to connect the deposit with the cement plant in Beli Izvor, and plans have been formulated for construction of a nitrogenous fertilizer plant near Chiren to utilize natural gas from the Vratsa deposits.

---

[11] Zemedelsko Zname (Sofia). Jan. 5, 1965, p. 3.

The Mineral Industry of Czechoslovakia

By Bernadette Michalski[1]

◆

GENERALLY higher levels of mineral production contributed to the modest recovery of the Czechoslovakian economy in 1964 from the 1962–63 slump. Total industrial output rose 4 percent over the 1963 level. The gross national product, to which the mineral industry contributes about 10 percent, rose 2 percent; however, the gross national income remained relatively unchanged. Labor productivity, particularly in the iron and steel industry, which employs 45 percent of the industrial labor force, was higher through adoption of an incentive awards program. Labor shortages at coal mines, notably Ostrava-Karvina, continued to restrict output. Total Czechoslovakian investments, including those for the mineral industry, were 12 percent higher than in 1963, but they failed to achieve the planned goal.

Although Czechoslovakia is among the most industrialized nations in the SEV[2] group, its varied metallurgical and fabricating facilities are strongly dependent upon an imported raw material base, primarily supplied by the U.S.S.R. Czechoslovakia's principal mineral resources are magnesite, coal, limestone, and kaolin.

There is a variety of other mineral deposits, but the quality of the ore is poor and mining conditions do not lend to economic exploitation; for example, estimated extraction and processing costs for lead from low-grade domestic ores reportedly would be 10 times higher than the cost of imported metal. A similar problem exists with Czechoslovakia's low-iron, high-silicon, high-sulfur iron ores. About 70 percent of the ore mined is put through the Krupp-Renn process and then smelted, thus considerably raising pig iron costs.

Significant new developments in the mineral industry in 1964 included the start of development of two lignite mines in central Czechoslovakia, the construction of a 500-kilometer gas pipeline paralleling the Druzba oil pipeline from the U.S.S.R., and the completion of the Sered nickel refinery.

PRODUCTION

Production of all mineral commodities officially reported attained planned goals for 1964 with the exception of nitrogenous fertilizers, which fell short of the proposed goal by 18 percent. Greatest increases were registered by the iron and steel industry, where steel ingot output surpassed planned goals by 3 percent, rolled steel and pipe by 4 percent, and steel for concrete reinforcement by 7 percent. In 1964, 2.6 percent of total steel output was defective, compared with 3.8 percent in 1963.

---

[1] Commodity research assistant, Division of International Activities.

[2] Includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Rumania, and the U.S.S.R.

TABLE 1.—Czechoslovakia: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum ingot including secondary[e]	40,000	50,000	60,000	60,000	60,000
Antimony[e]	1,600	1,600	2,000	2,000	2,000
Copper	NA	4,960	NA	NA	NA
Iron and steel:					
Iron ore ... thousand tons	3,120	3,294	3,477	[r]3,411	2,846
Pig iron ... do	4,696	4,971	5,177	5,254	5,716
Steel ingot ... do	6,768	7,043	7,639	7,600	8,377
Rolled products except pipe ... do	4,481	4,672	5,066	5,100	5,663
Pipe ... do	629	742	763	731	NA
Lead:					
Mine (content of ore)	6,500	6,500	13,500	13,500	13,500
Smelter	9,100	9,100	14,000	14,000	14,000
Manganese ore	154,000	101,000	83,000	85,000	84,000
Mercury[e] ... 76-pound flasks	725	725	725	725	725
Tin, mine (content of ore)[e] ... long tons	200	200	200	200	200
Nonmetals:					
Cement ... thousand tons	5,051	5,343	5,710	[r]5,178	5,493
Fertilizers:					
Nitrogenous (N content)	139,881	146,200	153,916	[r]153,811	[p]158,000
Phosphatic (P_2O_5 content)	146,964	167,421	180,460	[r]203,191	[p]241,000
Gypsum:					
Raw	330,000	354,000	373,000	[r]302,000	351,000
Calcined	26,000	27,000	24,000	22,000	[e]26,000
Kaolin	273,000	300,000	319,000	321,000	313,000
Lime ... thousand tons	2,307	2,357	2,369	2,254	2,347
Pyrite ... do	390	369	401	347	361
Salt ... do	168	188	182	187	184
Mineral fuels:					
Coal:					
Lignite ... thousand tons	2,928	3,235	3,667	4,000	4,133
Brown ... do	55,475	62,068	65,818	[r]69,300	71,500
Bituminous ... do	26,214	26,233	27,149	28,300	28,202
Coal briquets ... do	763	870	787	778	784
Coke:					
From brown coal ... do	2,176	2,155	2,111	2,114	NA
From bituminous coal ... do	8,458	8,537	8,930	9,299	9,420
Gas, manufactured ... million cubic feet	[r]151,585	[r]157,535	[r]175,875	[r]187,530	199,960
Petroleum:					
Crude ... thousand tons	137	154	177	180	195
Refinery products:					
Kerosine ... do	83	86	118	90	NA
Diesel fuel ... do	1,170	1,364	1,467	1,653	1,779
Lubricants ... do	79	86	96	103	93
Asphalt from all sources ... do	262	273	324	344	[p]398

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

TRADE

During 1964, total trade volume increased 8 percent. The increase was attributable in part to export deliveries, which were met and exceeded by the metallurgical, consumer goods, and food industries. This situation prompted contracts for unplanned imports of grain, fertilizers, and fodder.

Principal mineral exports such as rolled-steel products, coal, coke, kaolin, and magnesite constituted about a quarter of total export by value.

Because Czechoslovakia relies heavily upon imported raw materials to support its large manufacturing and fabricating industry, minerals—particularly raw materials such as coal, iron ore, and manganese ore—have regularly constituted about half of all Czechoslovakian import by value.

Comparison of official trade statistics of Czechoslovakia with those of the U.S.S.R. reveals that the Czechoslovak source materials are incomplete, particularly in the case of imports. To present as complete a trade picture as possible, both Czechoslovak trade statistics and those of the U.S.S.R., the principal trading partner, are given.

TABLE 2.—Czechoslovakia: Exports of selected metals and minerals

(Thousand metric tons)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Steel:			
Rolled products except pipe	1,118	1,316	Hungary 355; Poland 248; U.S.S.R. 141; West Germany 78.
Pipe	[r] 250	244	U.S.S.R. 130; Rumania 17; Poland 10.
Nonmetals:			
Kaolin	152	163	Poland 50; West Germany 35.
Magnesite	118	103	Hungary 41; Poland 30.
Mineral fuels:			
Coal:			
Brown	[r] 1,546	1,792	West Germany 1,541.
Bituminous	[r] 2,385	2,333	East Germany 1,014; Hungary 636.
Coke	1,570	1,758	East Germany 752; Hungary 258.

[r] Revised.

[1] Data from Vneshnyaya Torgovlya S.S.S.R. za 1962 god (Foreign Trade of the U.S.S.R. for 1963), Moscow 1964, 264 pp.

Source: Except as noted, Statisticka Rocenka C.S.S.R. 1964 (Statistical Annual of the C.S.S.R. for 1964). Prague, 1964, pp. 369-272.

TABLE 3.—Czechoslovakia: Officially recorded imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Iron and steel:			
Iron ore thousand tons	8,319	9,333	U.S.S.R. 6,937; India 1,000; Brazil 613.
Pig iron do	254	189	U.S.S.R. 121; mainland China 44; East Germany 20.
Rolled steel do	811	705	Not available.
Manganese ore	209,000	236,000	U.S.S.R. 105,000; India 64,000.
Nonmetals:			
Asbestos	28,307	22,665	U.S.S.R. 15,911; mainland China 2,055.
Fertilizers:			
Nitrogenous (N content)	21,000	44,000	East Germany 25,000.
Phosphatic (P_2O_5 content)	194,000	211,000	U.S.S.R. 93,000; Lebanon 23,000; Egypt 21,000.
Potassic (apparently K content)	237,000	253,000	East Germany 252,000.
Pyrite (S content)	69,000	110,000	Yugoslavia 21,000; U.S.S.R. 9,000.
Sulfur (elemental)	133,000	174,000	Poland 58,000; U.S.S.R. 20,000; mainland China 18,000.
Sulfuric acid	42,000	19,000	All from U.S.S.R.
Mineral fuels: Coal, anthracite	4,023	4,346	U.S.S.R. 2,983; Poland 1,265.

Source: Statisticka Rocenka C.S.S.R. 1964 (Statistical Annual of the C.S.S.R. for 1964), Prague, 1964, pp. 373-376.

TABLE 4.—Czechoslovakia: Imports of selected mineral commodities from the Soviet Union

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:		
Aluminum:		
Metal	11,500	10,200
Rolled products	1,553	1,209
Cadmium	201	159
Chromite	66,000	44,000
Copper:		
Unwrought	19,400	18,200
Rolled products	639	454
Iron and steel:		
Iron ore thousand tons	5,988	6,914
Pig iron do	185	122
Ferroalloys do	25	27
Steel:		
Rolled products except pipe	96,200	283,300
Pipe	[r] 1,000	900
Lead	18,200	13,100
Manganese:		
Ore	107,000	104,000
Peroxide	900	600
Tin long tons	197	----------
Zinc	[r] 10,600	9,700
Nonmetals:		
Apatite:		
Ore	48,900	51,500
Concentrate	225,700	216,100
Asbestos	12,700	15,600
Cement	2,000	103,000
Graphite	[r] 133	102
Sulfur:		
Elemental	18,800	20,700
Acid	31,700	46,000
Mineral fuels:		
Coal:		
Anthracite thousand tons	208	201
Bituminous do	2,494	2,574
Coke do	25	32
Petroleum:		
Crude do	3,673	4,222
Refinery products:		
Gasoline do	113	101
Kerosine do	224	261
Paraffin do	2	1
Others do	5	7
Total	344	370

[r] Revised.

Source: Vneshnyaya Torgovlya S.S.S.R. za 1962 god (Foreign Trade of the U.S.S.R. for 1963), Moscow, 1964, 264 pp.

COMMODITY REVIEW

METALS

Aluminum.—While lagging behind goals at midyear, aluminum output reportedly surpassed its unspecified goal for 1964. Czechoslovakia's single known aluminum refinery is at Ziar. About 18,000 tons of bauxite and 25,000 tons of alumina were imported from Guinea in 1964, and additional but unspecified quantities of these materials were imported from Hungary.

Gallium and Germanium.—Laboratory scale production of gallium and germanium from coal exhausts was conducted by the Spolana chemical plant, and a larger scale gallium and germanium production facility of unreported capacity was under construction at yearend, with completion scheduled for 1966. Plant production is to cover domestic requirements for the metals.[3]

Gold.—Czechoslovak geologists expanded gold exploration activities, including driving drifts at a depth of 170 meters in the hope of discovering extension of veins in historic mines such as Kuplik and Slojer. Gold deposits reportedly were uncovered in the Ostretin area, but their extent was unreported.

In 1964 facilities for extraction of gold from anodes were placed in operation at Kremnica. Prior to the development of a hydrometallurgical process, anodes containing gold were exported for processing. During 1964 more than 500 troy ounces of gold and 59,000 ounces of silver were extracted from Kremnica anodes.

---

[3] Rude Pravo (Prague). Apr. 10, 1965, p. 1.

Iron and Steel.—New management methods which included the introduction of bonus pay for increased output resulted in overfulfillment of all 1964 goals set for metallurgy. Higher labor productivity was particularly evident at the Trinec Ironworks, which produces a third of all Czech steel, and at the Klement Gottwald Ironworks at Kuncice. Other management efforts were focused on cutting cost in steel production, particularly maintenance costs, and tightening coke consumption to permit greater export. An experimental program was adopted to partially replace coke with heating oils at the Klement Gottwald Ironworks, where 20 kilograms of oil was consumed per ton of pig iron. One kilogram of heating oil replaces 1.5 kilograms of metallurgical coke. The successful operation of the Kuncice plant prompted the adoption of heating oils as fuel for three Ostrava metallurgical plants.[4]

Construction continued on the East Slovakian iron and steel mill with completion of a rolling mill announced in September. This complex will be Czechoslovakia's largest, with an eventual steel ingot capacity of 7 million tons. Raw material for the complex will undoubtedly be supplied by the U.S.S.R., the source of more than two-thirds of Czechoslovakia's current iron ore imports and of half the manganese imports.

Nickel.—Final stages of the Sered nickel plant were completed in August. The plant, under construction for 4 years and originally scheduled for production in 1962, produces nickel directly from iron nickel ores, which ores have been received from Albania and Cuba for processing. The Sered plant's annual capacity was reported at 2,000 metric tons of refined nickel.

NONMETALS

Czechoslovakia, self-sufficient in barite, bentonite, feldspar, kaolin, limestone, magnesite, and perlite, continued efforts to develop these items for export, by increasing the quality of product through technologic improvements in extraction and refinery facilities. Magnesite refining has received particular interest with the expansion of heavy suspension refining methods and introduction of flotation methods. Although asbestos, fluorspar, and gypsum have been regularly mined, production levels are regarded as inadequate for future domestic consumption needs.

Continued expansion of mineral fertilizer production was evidenced in the opening of the Moravian superphosphate plant in September and the continued construction on the second stage of the Sala nitrogen plant.

MINERAL FUELS

Coal.—Czechoslovakia's principal energy sources were bituminous and brown coals. The chronic mine labor shortage prompted continued efforts to adopt more mechanized methods. Washing unit capacity has been inadequate to maintain coal quality and is located at considerable distances from the mines, placing even more stress on the overburdened transportation system. Storage facilities have been inadequate, resulting in coal deterioration from exposure. In addition to the coal extraction, beneficiation, transport, and storage problems, there has been apparent difficulty in the economic utilization of coal.

---

[4] Technicky Tydenik (Prague). Oct. 14, 1964, p. 3.

The Ostrava-Karvina basin supplied 80 percent of the total bituminous coal output. About half of the total output (14 million tons) was converted to coke. About 20 percent of the bituminous coal output (6 million tons) was converted to electric power.

Nearly all of the nation's brown coal output was extracted from the Mostov-Sokolovo basin in northwest Czechoslovakia. A third of total output (23 million tons) was consumed in thermal electric power generation.

Two new coal mines, Sardice and Hovorany, were under development in central Czechoslovakia. The lignite coals produced from these mines will supply the Hodonin electric powerplant.

Petroleum and Natural Gas.—Crude petroleum and natural gas production was insignificant; however, the petroleum refining industry, dependent on about 4 million tons of U.S.S.R. crude oil annually, supplies most of Czechoslovakia's petroleum product requirements.

Construction of a 520-kilometer pipeline to supply natural gas from the U.S.S.R. has begun. First deliveries are scheduled for early 1967, at which time about 35,000 million cubic feet will be delivered annually. Initial plans were to utilize the gas at the Sala chemical plant, now in final stages of construction.

The Mineral Industry of Denmark[1]

By Stephen C. Brown[2]

◆

DENMARK'S economy expanded in 1964 more rapidly than during 1963; the growth in real output was estimated at 6 percent, compared with 2 percent in 1963. The mineral industry shared in this growth, but made only a small contribution to the overall economy; in 1963 it accounted for less than 2.5 percent of the gross domestic product. The Danish mineral industry, consisting primarily of mineral-processing industries such as petroleum refining and iron and steel, cement, and fertilizer manufacture, remained almost entirely dependent on imports for its raw materials aside from a small quantity of coal and some nonmetallics and construction materials. Consequently mineral imports (by value) increased about 18 percent in 1964, compared with only 12 percent in exports. In both 1963 and 1964 mineral imports (by value) were roughly ten times mineral exports.

GOVERNMENT POLICIES AND PROGRAMS

There were no significant changes in government policies about minerals during the year. A related development was negotiations with West Germany concerning demarcation of the limits of respective national claims to offshore resources in the North Sea. In accordance with the provisions of the European Free Trade Area agreement, customs duties on imports of manufactured goods from member countries of EFTA were again reduced; in mineral trade, these tariff changes are likely to affect imports of metal manufacturers most significantly.

PRODUCTION

Official data for mineral production in 1964 were not available in time for inclusion in this chapter, but unofficial trade estimates indicated a substantial increase in iron and steel output, a decline in production of solid fuel (coal and fuel briquets), and a very substantial rise in the output of refined petroleum products due to the full-year operation of the second refinery in Denmark, which came on-stream in the fall of 1963. Available estimates also indicated a substantial increase in output by the cement industry.

---

[1] For geographic reasons the mineral industry of Greenland (politically a part of Denmark) is treated in a separate chapter.
[2] International economist, Division of International Activities.

TABLE 1.—Denmark: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 ^{e}
Metals:					
Iron and steel:					
Bog iron ore	^{e} 95,000	85,000	95,000	85,000	90,000
Pig iron	69,000	^{r} 65,638	68,576	^{r} 69,368	70,000
Steel:					
Ingots	273,900	^{r} 279,486	^{r} 320,583	316,100	351,000
Semimanufactures, including castings	217,500	^{r} 256,842	^{r} 280,493	^{r} 287,527	NA
Nonmetals:					
Cement:					
Portland thousand tons	1,268	1,375	^{r} 1,424	^{r} 1,287	1,750
Other do	174	210	^{r} 208	^{r} 234	250
Chalk, washed	34,100	29,700	30,000	30,000	35,000
Clay, kaolin:					
Crude	6,300	7,800	8,000	7,500	8,000
Refined	4,900	4,236	3,306	12,000	14,000
Diatomaceous materials:					
Diatomite	16,000	19,500	20,000	^{e} 20,000	37,000
Moler	185,300	193,100	209,400	192,000	191,200
Fertilizers:					
Superphosphate, 18 percent P_2O_5	107,601	56,560	----------	----------	NA
Potassium superphosphate	556,652	644,533	778,278	737,513	NA
Flint:					
Pebbles	3,964	5,040	5,000	5,000	5,000
Other forms	155,510	160,000	165,000	^{e} 165,000	NA
Gravel thousand cubic meters	3,092	3,745	3,500	3,500	3,600
Lime, all forms	132.688	146,907	146,753	^{r} 151,824	----------
Limestone thousand tons	2,915	3,239	3,332	3,150	----------
Mineral fuels:					
Coal thousand tons	2,309	2,163	2,025	^{e} 1,999	1,900
Coke do	398	405	418	^{e} 430	448
Fuel-briquets do	48	45	^{e} 50	^{e} 55	30
Peat do	170	113	61	50	50
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	(1)	674	2,059	3,531	4,993
Kerosine do	(1)	(1)	131	359	430
Distillate fuel oil do	52	368	1,966	3,157	5,405
Residual fuel oil do	(1)	945	4,449	6,486	9,678
Lubricants do	(1)	17	19	15	7
Other refinery products do	124	946	1,459	1,322	2,487
Refinery fuel and losses do	20	94	NA	465	718

NA Not available.
^{e} Estimate.
^{r} Revised.
[1] If any, included with other.

TRADE

In 1964 mineral imports, valued at $592 million, accounted for 22.8 percent of Denmark's total imports while mineral exports, at $59 million, were about 2.8 percent of total exports. In terms of volume there were sharp increases in imports of iron and steel, nonferrous metals, and crude petroleum, a smaller increase in imports of refined petroleum products, and a sharp decrease in imports of fertilizers and fertilizer raw materials. Coal imports decreased slightly; coke imports, sharply. Despite increased domestic production, cement imports increased sharply. Exports of iron ore, roasted iron pyrites, steel scrap, and iron and steel semimanufactures rose significantly, while exports of refined petroleum products increased by 65 percent.

TABLE 2.—Denmark: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964 p	Principal destinations, 1963
Metals:				
Aluminum, including alloys, all forms.	2,879	3,248	2,946	Sweden 1,860; West Germany 555; Brazil 272; Norway, 110.
Copper, including alloys:				
Waste and scrap	r 5,687	r 5,198	3,119	West Germany 4,080; Belgium-Luxembourg 669; Sweden 339.
Other forms	981	1,225	2,294	Sweden 455; West Germany 313; Portugal 216; Netherlands 39; Spain 38.
Iron and steel:				
Iron ore	68,775	50,974	57,774	United Kingdom 27,184; West Germany 17,337; Belgium-Luxembourg 2,276.
Iron pyrites, roasted	94,806	85,796	103,636	West Germany 84,027; United Kingdom 1,770.
Scrap	27,942	r 38,787	49,652	West Germany 21,446; Sweden 12,031; Norway 3,804; Japan 737.
Steel:				
Ingots and equivalent primary forms.	2,177	3,802	3,380	Norway 3,753; Netherlands 29; West Germany 15.
Semimanufactures	83,162	r 102,286	144,771	Sweden 63,085; West Germany 16,659; Norway 15,721.
Lead, including alloys, all forms.	4,750	r 4,393	5,196	Norway 1,566; United States 762; Switzerland 308; Colombia 148; Netherlands 127.
Magnesium	54	r 54	57	United Kingdom 48; France 5; Sweden 1.
Nickel	200	238	206	India 94; United Kingdom 85; West Germany 19; Italy 15; France 10.
Silver troy ounces	r 48,226	r 12,860	49,890	Netherlands 6,430; Norway 3,215; Finland 3,215.
Tin:				
Unwrought:				
Unalloyed long tons	18	53	45	Colombia 27; Sweden 20; Venezuela 5.
Alloys do	632	r 652	762	United States 114; Norway 99; Venezuela 86; Sweden 76; Italy 61.
Semimanufactures. long tons	19	r 28	31	Sweden 13; Panama and Canal Zone 7; Switzerland 5.
Zinc, including alloys:				
Unwrought alloys	2,012	918	1,185	Brazil 593; West Germany 59; France 52; Netherlands 45.
Other forms	2,156	r 2,253	2,239	West Germany 637; Japan 440; Italy 408; United Kingdom 384.
Base metals, not otherwise specified:				
Slag and ash	104,855	r 63,237	83,746	West Germany 55,022.
Metals, all forms	33	52	65	Sweden 30; West Germany 19; United Kingdom 1.
Nonmetals:				
Cement	156,786	r 142,198	150,742	United States 24,379; Sweden 12,531; Spain 11,765; Israel 11,000.
Chalk	28,282	33,727	31,048	West Germany 18,889; Sweden 8,667; Finland 3,046; Brazil 1,389.
Clays, all types	3,302	r 2,654	2,520	Finland 1,513; Sweden 672; Norway 376.
Diatomaceous earths:				
Moler	93,871	r 82,959	82,249	West Germany 44,262; United Kingdom 33,858; Netherlands 1,724.
Other	9,995	r 9,563	8,851	Sweden 3,362; West Germany 2,415; Norway 2,139.
Flint, all forms	28,478	26,606	35,039	West Germany 17,064; Sweden 3,436; Czechoslovakia 1,340.
Granite and sandstone	142,409	90,340	82,976	West Germany 89,699.
Gravel, all types. thousand tons	1,448	1,439	1,575	West Germany 1,425; Sweden 11.
Lime	10,240	17,375	21,880	Sweden 8,628; Norway 7,146; Iceland 1,010.
Limestone	47,917	50,020	58,651	Sweden 21,603; West Germany 20,459; Norway 6,120.
Quartz	390	r 42	150	Sweden 22; Norway 15; United Kingdom 5.
Sands, all types	106,223	r 124,338	121,535	West Germany 88,825; Sweden 29,032; Finland 2,533.
Stone, crushed	261,459	r 343,789	359,363	West Germany 339,905.
Other nonmetals	2,744	r 3,032	2,792	West Germany 1,778; Norway 264; United Kingdom 250.

See footnotes at end of table.

TABLE 2.—Denmark: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964 [p]	Principal destinations, 1963
Mineral fuels:				
Lignite and peat	31,065	58,079	50,331	West Germany 56,541; Sweden 1,194.
Coke	40,792	53,145	44,531	Norway 21,054; Sweden 19,124; Netherlands 6,019; West Germany 5,259.
Petroleum refinery products:				
Gasoline	143,255	[r] 87,272	176,838	Sweden 48,895; United Kingdom 36,441.
Kerosine	6,929	[r] 17,859	6,945	Sweden 13,844; Finland 1,672; Norway 878.
Gas and/or diesel fuel	86,959	[r] 42,714	111,438	Sweden 27,564; Norway 10,491; West Germany 3,648.
Residual fuel oil	299,588	218,986	313,698	Sweden 100,596; United Kingdom 64,104; West Germany 31,916.
Lubricants	3,956	[r] 5,826	6,500	Norway 2,632; Sweden 2,109; Finland 484; West Germany 267.
Other	5,275	[r] 4,537	7,410	Sweden 1,574; Norway 1,521; Finland 983.

[r] Revised.
[p] Preliminary.

TABLE 3.—Denmark: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Metals:				
Aluminum, including alloys:				
Ingot	6,656	[r] 5,802	7,236	Norway 4,225; U.S.S.R. 754; United Kingdom 254.
Scrap and waste	364	[r] 1,234	936	United States 732; Sweden 389; Canada 101.
Foil	[r] 2,245	2,158	2,658	West Germany 559; France 320; United Kingdom 317; Switzerland 285.
Semimanufactures except foil.	7,910	[r] 9,421	12,313	Sweden 2,427; Norway 1,316; United Kingdom 1,103; West Germany 1,034.
Copper, including alloys:				
Ingot	4,862	3,962	4,547	Belgium-Luxembourg 2,219; West Germany 1,147; United Kingdom 302.
Scrap and waste	107	[r] 18	45	Sweden 13; Iceland 4; United Kingdom 1.
Semimanufactures	25,242	21,738	24,128	Sweden 9,031; Belgium-Luxembourg 4,694; West Germany 2,040; Canada 1,881.
Iron and steel:				
Iron ore	1,445	1,111	1,072	Sweden 1,086; West Germany 25.
Pig iron and cast iron	110,627	81,651	118,957	U.S.S.R. 25,163; East Germany 20,610; West Germany 13,684; Sweden 9,849.
Ferroalloys	5,742	6,007	7,150	Norway 5,300; U.S.S.R. 365; Sweden 210.
Steel:				
Ingots and equivalent primary forms.	12,374	12,187	36,715	Norway 11,849.
Semimanufactures	793,628	[r] 759,304	1,045,848	West Germany 258,602; Belgium-Luxembourg 134,692; United Kingdom 117,408.
Lead, including alloys:				
Ingot	15,972	13,946	15,259	Sweden 3,398; U.S.S.R. 3,268; Belgium-Luxembourg 2,896; Yugoslavia 1,398.
Scrap and waste	3,850	3,694	4,638	Norway 1,756; Malaya 391; Singapore 323; Czechoslovakia 267.
Semimanufactures	[r] 636	[r] 886	807	France 332; Yugoslavia 178; West Germany 168; Belgium-Luxembourg 155.
Magnesium, all forms	96	26	138	Italy 12; Norway 12; United Kingdom 2.

See footnotes at end of table.

TABLE 3.—Denmark: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Metals—Continued				
Manganese ore	5,751	6,429	8,586	South Africa 4,907; mainland China 471; West Germany 450.
Mercury 76-pound flasks	580	[r] 740	1,015	Italy 325; Turkey 116; Mexico 104; Yugoslavia 96.
Nickel, all forms	931	[r] 885	815	United Kingdom 355; West Germany 314; Sweden 187.
Platinum, all forms. troy ounces	1,800	1,865	2,508	West Germany 675; United Kingdom 289; Belgium-Luxembourg 289; Sweden 289.
Silver, all forms thousand troy ounces.	4,244	[r] 3,183	4,155	United Kingdom 1,260; West Germany 855; Switzerland 473.
Tin, all forms long tons	1,303	1,152	1,454	Mainland China 402; Netherlands 272; United Kingdom 132.
Zinc, including alloys:				
Semimanufactures	6,848	[r] 5,167	6,547	Poland 1,815; Belgium-Luxembourg 1,521; West Germany 804; Yugoslavia 477.
Other forms	11,349	[r] 9,612	11,739	Norway 3,301; Belgium Luxembourg 2,643; Netherlands 1,509.
Base metals, not otherwise specified:				
Slag and ash	42,351	14,306	17,547	United Kingdom 14,034; Sweden 231; West Germany 85.
Metal	469	381	183	Mainland China 212; U.S.S.R. 90; Belgium-Luxembourg 39.
Nonmetals:				
Abrasives	3,486	2,743	4,336	West Germany 1,584; Italy 663; Netherlands 400.
Asbestos	21,114	17,417	19,433	Canada 7,658; Cyprus 5,398; U.S.S.R. 1,273; South Africa 1,207.
Cement	12,852	1,362	57,087	United Kingdom 698; West Germany 580; Sweden 37.
Clays, all types	64,085	66,383	70,697	United Kingdom 38,143; Czechoslovakia 14,131; West Germany 8,152.
Diatomaceous earth	1,107	1,342	1,760	United States 841; West Germany 316; France 123.
Dolomite	17,737	16,936	18,109	Norway 6,999; Belgium-Luxembourg 3,585; West Germany 3,232; Sweden 2,542.
Feldspar, fluorspar, leucite and related minerals.	6,150	6,754	4,739	Norway 5,473; Sweden 800; West Germany 18.
Fertilizer and fertilizer raw materials:				
Nitrogenous:				
Calcium nitrate	738,705	679,977	589,749	Norway 638,953; West Germany 40,864; United Kingdom 160.
Other	47,424	57,022	106,828	West Germany 27,106; Chile 20,979; Norway 8,717.
Phosphate:				
Phosphate rock	286,040	312,731	283,888	Morocco 227,317; United States 35,492; Tunisia 29,775; U.S.S.R. 15,187.
Phosphate fertilizer	138,750	[r] 112,135	98,373	Netherlands 35,118; Belgium-Luxembourg 18,438; West Germany 17,811; Norway 17,331.
Potassic, all types	288,197	286,654	286,825	West Germany 142,805; East Germany 91,460; France 34,675.
Undifferentiated	21,273	[r] 18,619	41,003	West Germany 9,915; Norway 8,459 Belgium-Luxembourg 105.
Graphite	583	[r] 371	411	West Germany 152; United Kingdom 81; Norway 61; Madagascar 50.
Granite and sandstone	29,288	27,346	24,235	Sweden 26,532; Norway 592; West Germany 156.
Gypsum	59,985	[r] 50,831	79,055	Poland 43,164; France 3,200; West Germany 2,349.
Limestone	22,862	41,607	42,864	Sweden 39,417; Norway 2,024.
Magnesite	2,546	[r] 3,367	3,816	Austria 1,732; Netherlands 1,049 Sweden 193; Canada 150.
Marble	13,128	[r] 10,560	8,985	Sweden 8,839; Italy 1,052; Belgium-Luxembourg 294.
Mica	116	[r] 231	191	United Kingdom 161; Norway 68.
Pyrites, unroasted	136,545	[r] 132,471	134,662	Spain 84,140; Norway 48,311; West Germany 20.
Quartz and quartzite	20,606	[r] 18,469	24,600	Sweden 16,593; Norway 1,316; West Germany 212.
Salt	147,006	170,478	165,778	West Germany 94,880; Netherlands 33,009; United Kingdom 26,645.

See footnotes at end of table.

TABLE 3.—Denmark: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Nonmetals—Continued				
Slate	5,642	r 5,482	7,040	Norway 2,225; Sweden 1,508; West Germany 1,229.
Stone, crushed	50,416	r 56,188	109,166	Sweden 47,685; West Germany 6,365; Norway 2,137.
Sulfur, elemental	9,826	r 12,472	10,902	France 8,700; West Germany 3,569; Sweden 82.
Talc	11,792	11,079	13,174	Norway 9,157; Sweden 1,123; Austria 260; France 199.
Mineral fuels:				
Coal, all grades. thousand tons	4,158	4,173	3,952	Poland 2,292; United Kingdom 903; U.S.S.R. 630; East Germany 192; United States 59; West Germany 59.
Coke, all grades do	1,361	1,421	1,167	West Germany 775; United Kingdom 307; U.S.S.R. 232; Netherlands 69.
Crude oil do	1,256	1,779	3,040	Iran 1,340; Kuwait 270; Venezuela 60.
Petroleum refinery products:				
Gasoline thousand tons	1,180	945	1,059	United Kingdom 325; Netherlands 253; Venezuela 159; Bahrein Qatar 70.
Kerosine do	304	398	374	United Kingdom 223; Netherlands 52; West Germany 34; Bahrein Qatar 33.
Gas and/or diesel oil do	2,039	2,393	2,492	United Kingdom 783; Netherlands 469; West Germany 217; Bahrein Qatar 205.
Residual fuel oil do	2,398	2,417	2,696	Netherlands 715; United Kingdom 507; U.S.S.R. 373; Bahrein Qatar 169; Venezuela 162.
Lubricants do	83	69	88	United States 23; United Kingdom 22; Netherlands 9; Norway 6.
Bitumen and asphalt. do	121	121	168	West Germany 55; Netherlands West Indies 43; Sweden 17.
Other do	122	109	108	West Germany 66; Netherlands 17; United Kingdom 10; Norway 6.

r Revised.

COMMODITY REVIEW

NONMETALS

A new fertilizer distributing firm, Ny Nitrogen A/S, jointly owned by a Danish group (51 percent) and W. R. Grace & Co. (49 percent) was organized to import and distribute liquid anhydrous ammonia, which will be supplied by Grace from its Trinidad plant. Storage and distribution facilities have been built at Lyngsodde on the Little Belt. The Danish-Norwegian fertilizer producer, Dansk-Norsk Kvaelstoffabrik, began production of liquid ammonia at its new Grenaa plant. Danish prices of liquid ammonia have fallen from 0.88 to 0.69 kroner per kilogram in the last 2 years.

MINERAL FUELS

Estimates indicated a smaller domestic output of coal, though the production of coke was believed to have increased slightly; the decreased output of domestic solid fuel could have been due to the mild winter in 1963–1964—imports of coal and coke also decreased.

The full-year operation of the new refinery of Gulf Oil Refining at Stignaes resulted in sharp increases in Danish imports of crude oil and in production and exports of refined products; however, imports of refined products still rose by 8 percent. The Shell refinery, the third in Denmark, is to come on-stream in 1965. Dansk Esso was reported to be expanding the capacity of the Kalundborg refinery after it took over operations from Tidewater. Denmark is shifting rapidly to petroleum sources of energy; data on its energy balance in 1963 published by the Danish Statistical Department in 1964 show that petroleum sources provided 62 percent of the gross consumption of energy in 1963, compared with only 35 percent supplied by solid fuels. In 1964 Esso processed 13.9 million barrels of imported crude oil, while the new Gulf refinery handled 8,017,000 barrels. Imports of 1,025,000 barrels of products by Esso, 1,564,000 barrels by Maersk, and 235,000 barrels by others raised the total supply to 23,718,000 barrels.

The A. P. Møller-Gulf-Shell consortium holding the concession for gas and oil prospecting in Denmark completed seismic prospecting in the North Sea and continued with seismic tests in Jutland and on the Danish islands; test drillings were expected to begin in 1965. Meanwhile, the Government began talks with the Government of West Germany concerning delimitation of their respective claims to offshore areas in the North Sea; a draft agreement was reported in March 1965 on a partial borderline for about 30 nautical miles to a point equidistant from Blaavandshuk and the island of Sylt. The agreement was to be submitted to the governments for ratification; both parties maintained reservations about the remainder of the boundary.

SOURCE MATERIALS

Data about mineral production are from Statistisk Arbog (annual) and Statistiske Efterretninger (weekly), published by the official Det Statistiske Departement; 1964 figures are trade estimates supplied by the U.S. Embassy, Copenhagen. Trade data are from Danmarks vareindførsel og-udførsel (annual) and Vareomsaetningen med udlandet (monthly), published by Det Statistiske Departement. Official trade statistics are based on the general trade system, including reexports in general import figures, though separate tables for transit trade are shown. The trade tables in this chapter are not corrected for reexports, which are negligible in the mineral trade. Other information is from dispatches of the U.S. Embassy, Copenhagen, and in occasional instances, from the previously mentioned official sources or from press reports.

The Mineral Industry of Finland

By F. L. Klinger[1]

◆

FINLAND'S mineral industry continued to expand during 1964. Total production, consumption, and trade were substantially greater than in 1963, and productive capacity was increased. Finnish mines again produced about 10 percent of world output of vanadium and cobalt, as well as important supplies of iron, copper, zinc, and other metals and minerals for domestic consumption or export.

The most important event of the year was the completion of the blast furnace for the State-controlled steelworks under construction at Raahe. This installation, which doubled Finland's capacity for pig iron production, was in operation by September.

In other developments, the Raajärvi iron mine was opened in northern Finland. Additional sources of copper, lead, and zinc became available as the Korsnäs and Metsämonttu mines were reopened near yearend, and new reserves of nickel ore were reported at Kotalahti. New plant facilities were under construction at Raahe (steel), Uusikaupunkki (phosphoric acid), Mantyluoto (titania), and near Porvoo where Finland's second petroleum refinery is being built. Exploration, development, or metallurgical testing was continued on deposits of chromite, iron, copper, and nickel in other parts of the country.

Increased production in the mining and basic metals industries in 1964 contributed to a 5-percent rise in the gross domestic product ($7.1 billion at market prices)[2] and a 7-percent increase in gross industrial output. Profits did not increase proportionately, however, because of higher taxes and a 12-percent increase in industrial wages. The wage increases followed new 2-year labor agreements negotiated in January. The agreements also provided for an additional wage increase of 3.8 percent on January 1, 1965.

GOVERNMENT POLICY AND PROGRAMS

The Finnish Government was the principal operator in the mineral industry and followed an active program of exploration, development, and research designed to make maximum use of the country's mineral resources. Most of the developments in the industry were the results of this policy. The principal State mineral industry firms in 1964 were: Outokumpu Oy. (nonferrous metals and sulfur); Otanmäki Oy. (iron ore, vanadium, and titanium); Rautaruukki Oy. (iron and steel); Rikkihappo Oy. (chemicals); Typpi Oy. (fertilizers and rare earth oxides); and Neste Oy. (petroleum refining). Oy. Vuoksenniska Ab. and Paraisten Kalkkivuori Oy. continued to be the principal private firms in production of ferrous metals and nonmetallic minerals, respectively. Since September 1963 the Bank of Finland provided loans to the metal industry for financing of sales. This assistance was withdrawn in August because of increased monetary liquidity and increased demand. In December, Parliament increased the taxes on liquid fuels.

---

[1] Foreign minerals specialist, Division of International Activities.

[2] Kansallis-Osake-Pankki, Economic Review No. 1, 1965 (Helsinki). Where necessary, values have been converted from Finnish marks (Fmk) at the rate of Fmk3.2 equals US$1.00.

PRODUCTION

The gross value of metal and mineral production excluding petroleum products in 1964 was estimated at about $137 million, or about 2 percent of the gross domestic product. Of the total value, metals constituted 78 percent, followed by nonmetals (21.8 percent) and peat (0.2 percent). By value, the principal commodities were iron and steel ($57 million), copper ($26 million), cement ($25 million), and zinc concentrates ($10.5 million). In addition, petroleum products, with a gross estimated value of $63 million, were produced by the Neste Oy. refinery from imported crude oil.

Pig iron and crude steel output increased by 54 and 15 percent, respectively, compared with 1963 figures. Mine production of copper, zinc, and cobalt decreased 5 to 10 percent, while increases of 10 to 40 percent were recorded in iron ore, nickel, vanadium, and ilmenite. Although pyrite production was only slightly higher than in 1963, output of iron concentrate and sulfur was substantially increased at the Kokkola smelter. Increases of 10 percent were also reported for limestone, cement, and petroleum products.

TABLE 1.—Finland: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Cobalt (content of pyrite concentrate)[1]	1,190	1,240	1,120	1,150	1,030
Copper:					
Concentrate (10 to 26 percent Cu)	137,743	165,185	176,942	155,079	147,342
Metal content of concentrate	[r] 28,213	[r] 34,019	[r] 35,107	[r] 33,728	[r] 32,601
Electrolytic	30,971	34,300	33,930	37,797	33,177
Sulfate (metal content)	231	230	245	228	[e] 220
Gold[2] troy ounces	20,350	20,600	15,250	20,400	22,050
Iron and steel:					
Iron concentrate:					
From magnetite ore (56 to 68 percent Fe) thousand tons	[r] 245	[r] 282	296	362	[e] 460
From pyrite:					
Kokkola product (65 to 68 percent Fe) thousand tons	----------	----------	6	152	204
Other roasted (50 to 60 percent Fe [e])[3] thousand tons	149	207	172	167	125
Pig iron do	105	147	341	375	572
Steel:					
Crude, including castings do	273	298	331	326	371
Rolled products do	[r] 319	[r] 288	[r] 284	[r] 286	328
Lead:					
Concentrate (51 to 69 percent Pb)	3,124	4,725	4,181	1,645	3,009
Metal content of concentrate	1,592	3,120	2,868	1,145	1,890

TABLE 1.—Finland: Production of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:—Continued					
Nickel:					
Concentrate (5 to 6 percent Ni)	36,064	34,698	44,912	54,439	58,773
Metal content of concentrate	2,149	1,999	2,431	2,929	3,168
Electrolytic	467	1,804	2,329	2,694	2,943
Sulfate (metal content)	114	161	162	156	147
Rare earth oxides	------	------	------	NA	NA
Selenium ... kilograms	5,152	6,031	5,351	6,993	6,577
Silver [2] ... troy ounces	390,350	456,150	380,500	579,950	607,900
Titanium:					
Ilmenite concentrate (44 to 45 percent TIO_2)	83,660	19,298	87,190	93,858	116,063
Dioxide	265	6,041	[e] 12,000	[e] 16,000	[e] 17,000
Tungsten concentrate (30 percent WO_3 [e])	------	101	------	------	------
Vanadium pentoxide	1,013	1,134	1,020	1,248	1,756
Uranium concentrate	[r] 49	[r] 73	------	------	------
Zinc:					
Mine concentrate (54 to 55 percent Zn)	77,044	85,388	96,045	119,988	114,510
Metal content of concentrate	42,028	46,596	52,171	66,353	62,990
Nonmetals:					
Asbestos	9,556	9,379	9,860	[r] 9,254	10,533
Cement ... thousand tons	1,253	1,341	1,357	1,419	1,559
Diatomite	1,322	730	1,200	[r] 1,179	2,170
Feldspar	9,305	[r] 14,788	15,060	13,280	10,730
Fertilizer (superphosphate; 20 percent P_2O_5)	384,500	354,200	339,500	471,700	[2] 470,000
Lime (unslaked) ... thousand tons	220	220	220	212	240
Limestone and dolomite ... do	2,500	3,100	2,900	3,200	3,500
Marble	1,000	400	500	600	800
Pyrite	[r] 264,687	[r] 274,376	[r] 474,841	[r] 540,651	[r] 551,000
Quartz	NA	NA	NA	30,000	NA
Soapstone or steatite ... square meters	2,800	1,100	880	800	964
Sulfur:					
Pyrite (sulfur content)	[r] 112,000	[r] 116,000	[r] 218,000	[r] 252,000	[r] 260,000
Elemental (from pyrite)	------	------	[r] 4,757	[r] 38,214	68,139
Talc	9,986	6,320	6,430	[r] 6,756	6,000
Wollastonite (80 percent)	NA	NA	NA	2,000	3,000
Mineral fuels:					
Coke ... thousand tons	148	133	318	164	145
Peat (water content 35 percent) ... do	[r] 120	[r] 105	[r] 90	[r] 112	110
Fuel briquets [4] ... do	8	11	15	18	17
Petroleum refinery products:					
Gasoline	346,027	364,603	424,911	526,023	553,424
Kerosine	34,022	24,801	16,351	17,271	13,320
Distillate fuel oil	198,006	224,160	244,560	395,916	421,307
Residual fuel oil	359,525	344,472	483,413	991,824	1,047,853
Liquefied gases	16,318	20,375	27,275	31,032	34,116
Bitumen and other	117,726	182,059	159,913	166,939	291,692
Total refinery products	1,071,624	1,160,470	1,356,423	2,129,005	2,361,712
Refinery fuel and loss	111,414	124,415	144,585	212,620	191,916

[e] Estimate. [r] Revised. NA Not available.

[1] Estimated from pyrite concentrates produced at Outokumpu and Otanmäki.

[2] Approximate; calculated from production reported in kilograms.

[3] Total of exports of roasted pyrite and roasted pyrrhotite. Includes 4,000 tons domestic consumption in 1960.

[4] Raw material may be wood sawdust or peat.

TRADE

Exports of metals and minerals by Finland in 1964 were valued at an estimated $73 million, or 5 percent of all exports, an increase in value of about 50 percent compared with 1963 figures. Metals and metallic ores made up 97 percent of the total and consisted mainly of pig iron, copper, and ores of iron and zinc. The principal destination was Sweden, followed by West Germany and Belgium.

Imports of metals and minerals in 1964 were valued at an estimated $310 million, or 20 percent of all imports. This was an increase of $50 million, nearly 20 percent more than in 1963. Mineral fuels accounted for 48 percent of the total value, and metals accounted for 46 percent. The major imported commodities were coal, crude oil, petroleum products, iron, steel, and aluminum. The Soviet Union was the principal supplying country, followed by the United Kingdom and Sweden.

By economic groupings, European Economic Community (EEC) countries received 41 percent of Finland's metal and mineral exports, followed by European Free Trade Association (EFTA) countries (37 percent) and East Europe (8 percent). East Europe supplied 51 percent of imports, followed by the EEC (18 percent) and EFTA (17 percent).

TABLE 2.—Finland: Exports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964 [2]	Principal destinations, 1963
Metals:				
Aluminum:				
Unwrought	103	77	800	NA.
Semimanufactures	603	1,058	1,201	EFTA 531; Colombia 234; U.S.S.R. 204.
Scrap	--------	914	649	Common Market 467.
Copper and copper alloys;				
Unwrought	4,735	8,917	6,848	West Germany 3,220; Poland 3,012; Czechoslovakia 730; France 586.
Semimanufactures	3,209	5,731	9,340	Sweden 3,349; Colombia 827; Norway 607.
Iron and steel:				
Iron ore:				
Lump, concentrate, and sinter.	212,153	211,349	316,629	Poland 114,300; West Germany 42,844; Czechoslovakia 35,800.
Roasted pyrite	166,569	123,744	119,746	West Germany 157,029; other Common Market 9,455.
Roasted pyrrhotite	5,364	42,740	5,032	
Pig iron, including cast iron	180,620	233,634	480,782	Sweden 79,402; West Germany 46,838; United Kingdom 27,190; Netherlands 21,236.
Ferroalloys	--------	36	39	NA.
Scrap	3,102	3,033	4,240	West Europe [6] 2,200; Japan 811.
Ingots and other primary forms	3,451	340	10,688	NA.
Semimanufactures	7,618	10,223	17,198	Denmark 5,038; Norway 1,943; Sweden 1,184.
Lead:				
Concentrates	5,367	--------	1,840	Belgium-Luxembourg 2,356.[3]
Unwrought and semimanufactures.	58	2	89	NA.
Scrap	--------	--------	127	
Nickel:				
Unwrought	2,225	2,366	3,172	West Germany 761; Italy 416; Poland 295; United Kingdom 287.
Other	1	16	--------	West Germany 16.
Silver and platinum group metals.[4] troy ounces	1,929	418	1,318	NA.
Tin:				
Unwrought and semimanufactures. long tons	4	2	3	NA.
Scrap do	--------	78	44	NA.
Titanium:				
Ilmenite concentrate	37,773	63,305	50,584	Italy 28,277; United Kingdom 24,328; East Europe 10,700.
Dioxide	9,902	15,037	15,205	United States 8,114; Sweden 1,374 Common Market 1,253.
Tungsten concentrate	12	--------	--------	
Uranium and thorium	NA	--------	2	
Vanadium compounds [5]	1,306	1,585	2,222	NA;
Zinc:				
Concentrates [5]	101,473	142,943	147,255	Belgium-Luxembourg 72,063; West Germany 35,824; Sweden 18,900.
Unwrought and semimanufactures.	--------	268	--------	NA.
Scrap	--------	512	114	NA.
Other base metals	NA	87	15	Poland 61.
Nonmetals:				
Asbestos	5,726	5,744	7,554	West Germany 1,894; Sweden 1,835; other West Europe 1,251.
Diatomite	127	101	120	NA.
Feldspar	11,175	7,946	5,530	East Europe 6,737; West Germany 1,013.
Mica	75	60	50	All to Sweden.
Pyrite	71,011	54,623	78,701	All to West Germany.

See footnotes at end of table.

TABLE 2.—Finland: Exports of minerals and metals[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964[2]	Principal destinations, 1963
Nonmetals:—Continued				
Stone, sand and gravel:				
Building stone, unworked	5,754	6,389	7,270	Common Market 15,061; EFTA countries 4,739; United States 680.
Building stone, worked	1,215	906	1,112	
Crushed stone and other	2,458	16,056	63,971	
Sulfur	--------	1,807	2,178	Sweden 1,778.
Mineral fuels:				
Coal	7,533	17,808	18,621	Sweden 20,061; Belgium-Luxembourg 5,700; other West Europe 7,915.
Coke	5,533	8,832	9,517	
Peat	NA	7,171	130	
Petroleum refinery products:				
Gasoline[6]	153	184	220	Bunkers 18,858 (including distillate fuel oil 5,822 and residual fuel oil 13,036); most of remainder to U.S.S.R.
Kerosine	13	18	7	
Distillate fuel oil	8,270	5,968	3,831	
Residual fuel oil		13,049	10,408	
Lubricants, including grease	192	301	186	

[e] Estimate. NA Not available.

[1] Most figures are revised from those reported in 1963 edition of Volume IV, Minerals Yearbook.

[2] Provisional data.

[3] Source: Statistical Office of the Economic Communities. Analytical Tables, Import—1963, p. 102. Brussels, August 1964. E.E.C., Tableaux Analytiques.

[4] Calculated from quantities reported in kilograms.

[5] Quantities exceed production each year, probably represent gross weights of shipments.

[6] Estimated from quantities reported in cubic meters.

TABLE 3.—Finland: Imports of minerals and metals[1]

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964[2]	Principal sources, 1963
Metals:				
Aluminum:				
Unwrought	6,814	4,059	6,338	U.S.S.R. 2,480; Canada 960; West Europe (EFTA) 462.
Semimanufactures, including scrap.	11,432	10,995	13,358	United Kingdom 3,053; Sweden 2,897; Belgium 2,018; West Germany 872.
Antimony	NA	89	139	NA.
Cadmium	NA	6	11	NA.
Chromite	----------	20	36	NA.
Cobalt	119	33	----------	West Germany 25.
Copper:				
Unwrought	4,240	2,739	5,755	Rhodesia-Nyasaland 1,421; United Kingdom 941; Sweden 331.
Semimanufactures	2,082	2,112	2,004	West Germany 755; United Kingdom 514; Sweden 442.
Iron and steel:				
Iron ore	448,671	390,751	513,575	Sweden 376,109; Brazil 7,043.
Scrap	128,051	82,374	140,890	U.S.S.R. 82,367.
Ferroalloys (including spiegeleisen).	9,730	10,027	7,220	U.S.S.R. 6,680; Norway 1,929.
Pig iron, including cast iron.	3,435	7,059	14,310	West Germany 3,554; Norway 3,034.
Ingots and other primary forms.	80,412	60,010	36,665	U.S.S.R. 28,457; Sweden 22,966; West Germany 3,569.
Semimanufactures:				
Bars, rods, sections, etc.	122,542	78,587	107,432	Sweden 14,593; West Germany 14,318; Poland 13,377; France 11,540.
Universal plates and sheets.	244,010	246,606	322,044	U.S.S.R. 79,982; United Kingdom 46,121; Belgium 32,087.
Hoop and strip	17,611	16,953	27,380	United Kingdom 6,424; West Germany 5,567; Belgium 3,027.
Rails and accessories	47,097	62,488	50,979	U.S.S.R. 61,542.
Wire (excluding wire rod).	17,075	13,666	15,537	Common Market 8,259; EFTA 5,174.
Tubes and pipes	69,639	62,630	79,938	West Germany 21,867; France 13,558; United Kingdom 6,595.
Castings and forgings	NA	289	127	EFTA 218; other West Europe 71.
Total semimanufactures.	517,974	481,219	603,437	East Europe 188,402; Common Market 172,467; EFTA 118,251.
Lead:				
Unwrought	10,826	15,499	11,028	U.S.S.R. 13,670; Sweden 791.
Semimanufactures	1,043	696	653	Common Market 497.
Magnesium, unwrought	8	20	18	NA.
Magnesium, scrap	----------	54	----------	NA.
Mercury ...... 76-pound flasks	812	754	435	NA.
Molybdenum, all forms	1	3	1	NA.

See footnotes at end of table.

TABLE 3.—Finland: Imports of minerals and metals[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964[2]	Principal sources, 1963
Metals:—Continued				
Nickel:				
Unwrought	394	147	231	U.S.S.R. 84; United Kingdom 61.
Semimanufactures	87	100	180	United Kingdom 51; other West Europe 33.
Scrap	----------	----------	125	
Platinum thous. troy oz.[3]	399	4	749	U.S.S.R. 1.6
Silver do		1,134		U.S.S.R. 845; West Europe 288.
Tin:				
Unwrought long tons	512	330	314	Mainland China 148; United Kingdom 72.
Semimanufactures	25	25	29	NA.
Tungsten	1	3	2	NA.
Vanadium	----------	1	----------	NA.
Zinc:				
Unworked	4,716	5,863	3,842	U.S.S.R. 3,262; Belgium 2,474.
Semimanufactures	410	307	384	NA.
Nonmetals:				
Abrasives	NA	1,614	1,409	NA.
Asbestos	6,867	6,088	6,755	U.S.S.R. 4,340; South Africa 872.
Cement, including lime	[r] 3,483	[r] 7,012	9,734	Denmark 3,503; other West Europe 3,393.
Chalk	9,576	9,953	9,269	NA.
Clay and other refractory minerals.	159,143	[r] 185,525	196,225	United Kingdom 142,851; West Germany 12,123.
Earth colors	418	90	47	NA.
Fertilizer materials:				
Raw phosphate	235,425	233,758	325,034	U.S.S.R. 118,483; Morocco 103,239.
Basic slag	11,123	10,532	10,031	Belgium 11,918; Sweden 7,415; Netherlands 7,045.
Superphosphate (less than 20 percent P_2O_5).	63,545	17,646	36,005	
Potassic fertilizer (more than 38 percent K_2O).	139,013	139,790	175,268	East Germany 62,039; U.S.S.R. 46,315; Common Market 31,435.
Quartz and quartzite	397	2,550	1,900	NA.
Salt thousand tons	274	267	307	Netherlands 115; East Germany 44; U.S.S.R. 24.
Steatite	2,844	2,583	3,826	NA.
Stone, sand and gravel:				
Building stone	954	939	563	[4] Sweden 83,673; Poland 65,217; Belgium 50,129; France 31,719; U.S.S.R. 19,409.
Gypsum and anhydrite	60,084	80,477	77,354	
Limestone	100,659	74,017	206,903	
Quartz sand	57,995	54,838	41,688	
Other sand	20,308	19,161	23,655	
Sulfur	83,546	59,372	67,293	France 29,376; Poland 8,530; United States 8,227; Mexico 4,134.
Titanium dioxide	1,062	1,089	1,550	West Germany 531.
Mineral fuels:				
Coal thousand tons	2,621	2,183	2,414	Poland 1,521; U.S.S.R. 647.
Lignite, including briquettes do	8	8	6	All to East Germany.
Coke do	357	352	887	U.S.S.R. 159; United Kingdom 105; West Germany 63; Poland 16.
Petroleum:				
Crude do	1,510	2,231	2,581	U.S.S.R. 1,709; Iran 423.
Refinery products:				
Gasoline[5]	17,400	20,000	12,500	Netherlands 11,800; Netherlands Antilles 5,600.
Kerosine	24,786	26,982	22,766	NA.
Distillate fuel oil	[e] 993,000	1,358,215	1,334,596	U.S.S.R. 1,353,000.
Residual fuel oil	[e] 900,000	586,452	893,059	U.S.S.R. 463,104; Rumania 120,170.
Lubricants, including grease.	55,894	51,247	64,372	United Kingdom 16,528; Sweden 15,144; United States 5,563.
Petrolatum and wax	NA	9,006	NA	West Germany 4,753; United States 1,278.
Liquefied gases	NA	509	680	NA.

[e] Estimate. [r] Revised NA Not available.

[1] Most figures are revised from those reported in 1963 edition of Volume IV, Minerals Yearbook.

[2] Provisional data.

[3] Estimated from quantities reported in kilograms.

[4] Total of shipments from all countries includes 43,000 tons of plaster.

[5] Gasoline estimated from quantities reported in cubic meters.

COMMODITY REVIEW

METALS

Aluminum.—Oy. Aluma Ab., a Finnish subsidiary of the Swedish firm, Svenska Metallverken Ab., planned to increase production of aluminum foil and sheet at its Kainby plant near Helsinki. A new foil mill was ordered from the United States, and capacity for production of flat and corrugated sheet will be expanded to 7,000 tons annually. Svenska Metallverken also has an interest in a cable, foil, and sheet plant of 4,000 tons annual capacity in Hangö.

Apparent consumption of aluminum in 1964 was about 17,600 tons, 25 percent more than in 1963 but about the same as in 1962. Exports, consisting mainly of foil, have doubled since 1962.

Chromite.—Investigations continued on the Elijärvi chromite deposits northeast of Kemi. The deposits are estimated to contain 17 million tons of material having an average Cr_2O_3 content of about 20 percent, but the relatively low ratio of chromium to iron (0.8 to 1.9) presents a difficult metallurgical problem. The testing program, conducted by Outokumpu Oy., was aided by a 500-kilowatt electric arc furnace acquired in late 1963.

Copper.—The reduced output of copper concentrates in 1964 was principally due to a 12-percent decrease in volume at the Outokumpu mine, but this reduction was mostly compensated by higher metal content of the Outokumpu concentrate and increased production from most other sources. Mines producing copper in 1964 (with tonnage of concentrate) included Outokumpu (95,000), Pyhäsalmi (28,000), Vihanti (10,000), Ylöjärvi (9,000), and Kotalahti (4,000). The Metsämonttu mine, inactive since 1958, was reopened late in the year and produced 150 tons of concentrate. Outokumpu Oy. owned all production facilities, including the smelter at Harjavalta and the electrolytic refinery and mills at Pori. The Pori refinery continued to produce Finland's total recorded output of gold, silver, selenium, and nickel sulfate as byproducts from electrolysis residue. Some additional alluvial gold may have been recovered from the Ivalojoki or Lemmenjoki districts of northern Finland. Exploratory and development work was continued at copper deposits in the Nivala and Kaavi districts.

Net exports of copper and copper alloys were 14 percent less than in 1963 and included 1,100 tons of unwrought metal and 7,300 tons of semimanufactures.

Iron and Steel.—*Iron Ore.*—Total production of iron concentrate in 1964 was estimated at about 665,000 tons, excluding roasted pyrite from the Outokumpu and Otanmäki mines. About half of this quantity was produced by Otanmäki Oy. from the Otanmäki, Karvasvaara, and Raajärvi mines; one third was produced by Outokumpu Oy. at the Kokkola smelter from pyrite mined at Pyhäsalmi; and the remainder was produced by Oy. Vuoksenniska Ab. from the Jussarö mine east of Hangö. Production from these sources increased an estimated 10 to 25 percent during 1964. Concentrates from the Otanmäki mine, after processing in the vanadium plant, were mostly exported as low-phosphorus ore. Jussarö concentrate was consumed at the Koverhar ironworks, while most of the remaining ore was consumed or stocked at the Raahe works.

The Raajärvi mine began production in September and by yearend had produced 43,780 tons of concentrates from 123,000 tons of crude ore. An additional 10,000 tons of lump ore was also produced. The mine is expected to eventually produce about 250,000 tons of concentrate annually from crude ore containing about 50 percent iron. Production of concentrate at the Karvasvaara mine, 8 kilometers east of Raajärvi, was 67,700 tons, or about the same as in 1963. The combined ore reserves at the Raajärvi and Karvasvaara mines were reported to total about 8 million tons.

Iron ore trade increased about 30 percent in 1964. Exports were about evenly divided between magnetite concentrate and sinter, while imports included 107,000 tons of lump ore and 393,000 tons of concentrate.

Ferroalloys.—Finland normally imports all ferroalloy requirements while producing ferroalloy raw materials for export. Imports of ferroalloys had annually increased, reaching about 10,000 tons in 1962 and 1963, but in 1964 there was a reduction of more than 25 percent. The principal decreases were in ferrosilicon (1,200 tons), ferromanganese (1,100 tons), and in ferrochromium (550 tons).

Pig Iron.—Production of pig iron increased 54 percent, compared with that of 1963. Most of the increase was attributable to operation of the new blast furnace at Raahe, but the bulk of total output again came from the Koverhar and Turku plants. At yearend, total annual Finnish productive capacity was about 980,000 tons, distributed as follows:

Plant:	*Ownership*	*Annual capacity (metric tons)*
Raahe	Rautaruukki Oy	550, 000
Koverhar	Oy. Vuoksenniska Ab. and Stora Kopparsberg Bergslags Ab. (of Sweden).	250, 000
Turku	Oy. Vuoksenniska Ab	100, 000
Åmminefors	Oy. Fiskars Ab	60, 000
Uusi Värtsilä	Wärtsilä Oy	[1] 20, 000

[1] Synthetic pig iron produced from iron ore and scrap.

Owing to limited steel production facilities, a large proportion of pig iron production continued to be exported. Net exports of pig iron more than doubled in 1964, to 466,000 tons. A large proportion of this quantity was destined for the Domnarvet works of Stora Kopparsberg Bergslags Ab. in Sweden.

Steel.—Production of crude steel in 1964 appeared to be about 7 percent higher than previously reported capacity and may have been due to improved facilities at Vuoksenniska's Imatra works. Electric furnaces have accounted for about two-thirds of Finnish steel production, with most of the remainder produced by open-hearth furnaces. Electric furnace capacity in 1963 totaled 240,000 tons annually, of which 90 percent was located at Imatra. About 70 percent of open-hearth steel is made at Åmminefors by Oy. Fiskars Ab., and the remainder at Taalintehdas (Dalsbruk) by Wärtsilä Oy.

Construction of the steelworks at Raahe was continued. In June, a $3.7 million order for electrical equipment for the rolling mill was placed with a Swedish firm. Contracts signed in September with the Davy and United Engineering Co. Ltd. of England provided for delivery and construction of equipment for a 300,000-ton plate mill. The mill is to be a four-high reversing mill, with rolls 3,600 millimeters wide producing plates mostly between 5 and 32 millimeters thick. The Davy and United contracts were reportedly valued at $16.8 million. The plants are scheduled for completion in 1967.

Lead and Zinc.—The Vihanti mine continued to produce most of the lead and zinc concentrates recovered in Finland. Mine lead production increased, owing to reopening of the Metsämonttu and Korsnäs mines, while production of zinc concentrates declined slightly despite 2,300 tons reported from the Outokumpu mine. Of total lead concentrate, 61 percent was produced at Vihanti, 34 percent at the Metsämonttu mine, and 5 percent at the Korsnäs mine. Of total zinc concentrate produced, 73 percent came from Vihanti and 24 percent from the Pyhäsalmi mine.

Nickel.—Exploration at the Kotalahti mine has reportedly increased ore reserves by an amount equivalent to 5 years' production. This was presumed to mean additional reserves of about 2.2 million tons, as the rate of ore extraction has been about 450,000 tons annually since 1962. Extension of the main shaft below the 330-meter level began in 1963 and may have been completed in 1964.

Mine and refinery production increased in 1964. The pentlandite-pyrrhotite concentrates were flash-smelted, and the nickel was recovered by electrolysis at Outokumpu's Harjavalta plant. Byproducts of the refinery included electrolytic copper and cobalt hydroxide.

Titanium.—Production of titanium dioxide at the Mantyluoto plant of Vuorikemia Oy. continued to be close to the rated annual plant capacity of 16,000 tons. In 1964, expansion of plant facilities was underway to increase capacity to 24,000 tons. The plant consumed an estimated 40,000 to 45,000 tons of Otanmäki ilmenite concentrate and 65,000 tons of sulfuric acid in 1963 and 1964.

Vanadium.—Production of vanadium pentoxide at the Otanmäki mine was 40 percent greater than in 1963. The increase was believed to be due to improved plant facilities as well as increased mine output.

NONMETALS

Construction Materials.—Although quarrying of limestone and production of lime and cement increased 10 percent in 1964, activity in the construction industry, as a whole, was not appreciably changed as compared with that of 1963.

Paraisten Kalkkivuori Oy., the largest operator in the field, continued investigation of a limestone deposit near Kolari. The company also operated an asbestos cement plant southwest of Helsinki and cement plants at Pargas and Villmanstrand. Lojo Kalksberg Ab. also produced cement at Virksby. Total cement capacity (1961) was 1,325,000 tons annually, of which two-thirds belonged to the Paraisten company.

In July 1964 the International Bank for Reconstruction and Development granted Finland a loan of $28.5 million to assist in construction and maintenance of the national road network.

Fertilizer Materials.—The State-owned chemicals firm, Rikkihappo Oy., contracted with the L. A. Mitchell Co. of England for construction of a phosphoric acid plant at Uusikaupunkki in western Finland. The plant will include facilities for production of 33,000 tons per year of acid and a fluorine recovery plant for production of fluosilicates. It was scheduled for completion in 1965.

Pyrite and Sulfur.—An estimated 218,000 tons of pyrite concentrate was produced at the Outokumpu and Otanmäki mines in 1964. This material, 98 percent of which was produced at Outokumpu, is usually roasted by pulp mills to recover the sulfur, and the cinder residue, containing small amounts of cobalt and copper, is returned to the mining companies. The cinder is normally exported to West Germany.

The remainder of Finland's pyrite concentrate production (333,000 tons) came from the Pyhäsalmi mine and was destined for processing at Outokumpu's Kokkola plant. This plant, employing the company's flash-smelting process, was designed to produce 85,000 tons of elemental sulfur, 75,000 tons of sulfur as dioxide, and 240,000 tons of high-grade (65 to 68 percent iron) iron concentrate from an annual input of 360,000 tons of pyrite. Production of elemental sulfur in 1964 was about 80 percent of rated capacity and was double the output of 1963. The Kokkola plant also produced 63,700 tons of sulfur as sulfur dioxide and 271 million kilowatt-hours of electricity.

The largest consumers of sulfur in Finland continued to be the cellulose and sulfuric acid industries. Cellulose plants account for the bulk of imports of elemental sulfur; these totaled about 85,000 tons annually in 1961–62. Imports in 1963 were reduced from those of previous years because of increased production at Kokkola, but they increased in 1964 despite the continuing rise in domestic production. The increased demand appeared to result from a 10-percent rise in cellulose output during 1964.

Since 1963, practically all of Finland's sulfuric acid has been produced from gaseous sulfur dioxide obtained from the Harjavalta and Kokkola smelters by Rikkihappo Oy. The company's Lappeenranta plant near Imatra was closed in September 1963. Most of the sulfuric acid was used to manufacture superphosphate and other fertilizers, and about 15 percent was consumed in titanium dioxide production. Rikkihappo also produced 30,000 tons of aluminum sulfate and 40,000 tons of sodium sulfate in 1963 from its Harjavalta plants.

Wollastonite.—Wollastonite continued to be produced in 1964 by Paraisten Kalkkivuori Oy. from an open-pit mine near Lappeenranta. The company planned to increase production and was constructing a new processing plant which was to be completed in late 1965. The wollastonite was used in Finland for the manufacture of glazed tile.

MINERAL FUELS

Finland continued to import its solid and liquid fuel requirements in 1964. Imports of solid fuels increased 30 percent[3] and those of liquid fuels rose 15 percent,[4] compared with 1963 figures.

---

[3] According to official foreign trade statistics (Ulkomaankauppa, December 1964). Coal statistics from the Ministry of Trade and Industry are 260,000 tons less. Coke statistics agree.

[4] Neste Oy. statistical office through U.S. Department of State.

Coal.—Coal consumption in Finland has been declining for several years owing to increasing use of oil and increasing use of process energy by industry. Consumption of coal by thermal powerplants has continued to increase, however, because of the widening gap between power demand and hydroelectric supply.

Total coal consumption in 1964 was slightly more than 2 million tons, about 5 percent less than in 1963. Of this total, 332,000 tons was used in electric power generation and 192,000 tons in manufacturing coke and gas. New thermal powerplants scheduled for completion in 1964–65 at Naantali (near Turku) and Hanasaari (near Helsinki) are expected to increase annual coal consumption by at least 200,000 tons.

Under a trade agreement signed in December, Finland will import 750,000 tons of coal and 540,000 tons of coke from the Soviet Union in 1965. These quantities are well above average annual shipments from the U.S.S.R. for 1961–63.

Coke.—Consumption of coke increased 80 percent in 1964. Most of the increase was due to requirements of the Raahe blast furnace, which will amount to about 300,000 tons of coke annually. Of total coke consumption, two-thirds was consumed in metals reduction and most of the remainder in space heating. Gasworks at Helsinki and Turku annually provide about 130,000 tons of coke, but this supply is not expected to last beyond 1970 as the plants are to be converted to consume light petroleum distillates.

Petroleum.—The Neste Oy. refinery at Naantali increased output of refined products by 233,000 metric tons while processing 10 percent more crude oil than in 1963.

Construction of a new oil refinery at Sköldvik, near Porvoo, was started in September by the Lummus Co. of New York. The refinery is to have a capacity of 2 million tons annually. The first section is to be completed within 1 year; production will be keyed to Finnish requirements which include a higher diesel-and-fuel oil ratio to gasoline than most refineries produce. Both the refineries are expected to be used to capacity by 1970.

Increased liquid fuel taxes, to be effective January 1, 1965, included increases of Fmk 0.064 per liter of gasoline and Fmk 0.114 per liter of gas oil.

Electric Power.—Consumption of electric energy in Finland increased by 12 percent in 1964, to 13.6 billion kilowatt-hours. About 65 percent of all electric power was generated by hydroelectric plants and the remainder by thermal plants. The economic limit of hydroelectric expansion was estimated in 1963 as 13 billion kilowatt-hours per year; demand beyond this level would have to be supplied from thermal sources. Production of electric power has increased at an average annual rate of about 10 percent since 1945.

Coal continued to be the principal fuel used in thermal plants. Latest data available indicate that 93,000 tons of fuel oil were used in thermoelectric plants in 1961 compared with 323,000 tons of coal.

SOURCE MATERIALS

Statistics on production were primarily obtained from dispatches of the U.S. Department of State, checked against published official figures where possible. Trade statistics are those published under Standard International Trade Classification (S.I.T.C.) headings in official foreign trade publications (Ulkomaankauppa), except for statistics on certain commodities which were available only under Brussels Trade Nomenclature (B.T.N.) headings. Countries of origin and destination are mainly those listed in "Commodity Trade Statistics 1963," published by the United Nations. Statistics on petroleum imports and production of petroleum products are those furnished by the Neste Oy. refinery. Other sources included various trade journals and company reports.

The Mineral Industry of France

By L. Nahai[1]

FRANCE in 1964 ranked third in world production of iron ore, fourth in aluminum and potash, fifth in bauxite and gypsum, and sixth in cement and iron and steel. In Western Europe, France was the leading producer of iron ore, bauxite, aluminum, sulfur, and some quarry products and supplied some of the requirements of this area for these commodities as well as for iron and steel and potash.

In 1964, the gross national product (GNP) of France in current francs grew by an estimated 4.9 percent. Indices of industrial production for a number of mining and metallurgical sectors increased 8.7 to 9.5 percent. Recovery of coal and iron ore production after the 1963 strike and increases in output of iron, steel, and a number of other metals and materials were contributing factors.

The value of mineral output in 1963 was about $1,574 million,[2] including that of solid fuels $672 million, quarry products $398 million, metallic minerals $207 million, and nonmetallic minerals other than quarry products $137 million. The value of mineral output in 1964 may have ranged from $1,590 to $1,600 million, with roughly the same percentage distribution among the commodity groups. The 1963 value was equivalent to 2.2 percent of the GNP (production intérieure brut) of $70,700 million in 1963 prices.[3]

The French steel industry established new records in production and export. Smelter production of most nonferrous metals increased.

France was the sixth largest world consumer of aluminum, copper and zinc and was fifth in lead consumption. Only for aluminum did smelter production exceed consumption, but zinc smelter output was close to consumption and that of lead was equal to about 70 percent of consumption. France remained dependent principally on metal imports to meet copper requirements; domestic refined copper production was equal to only 13 percent of consumption. Many industrial minerals such as asbestos, industrial diamonds, magnesite and mica, and crude phosphate were imported.

---

[1] Chief specialist, West Europe Area, Division of International Activities.

[2] Where necessary, values have been converted from francs (F) to U.S. dollars at the rate of F1=$0.20.

[3] Institut National de la Statistique et des Études Économiques. Annuaire Statistique de la France 1964. Paris, France, 1965, p. 476.

As of December 31, 1963, personnel registered in the extractive industry, other than quarrying and slate production, totaled 245,846, distributed as follows: coal and lignite 197,421; iron mining 23,400; other metal mining 4,899; potash 12,271; crude oil, natural gas, asphaltic limestone, and bituminous schist operations 5,752; and other 2,103. About 93,900 were engaged in quarries and 3,406 in slate mining. Cement and lime plants employed 15,110. Petroleum exploration, production, and refining accounted for 26,938.[4] Among metallurgical plants the iron and steel industry employed 130,579 production workers and 41,211 salaried employees; ferroalloy plants employed 3,970 and nonferrous metal plants 9,200. The total of about 529,000 was about 7 percent of the French industrial labor force (including the building industry) based on the 1962 census.[5]

PRODUCTION

In 1964 the index of industrial production, excluding buildings and public works, stood at 138 (1959=100) compared with 127 for 1963. Indices for the extractive industry also increased at various rates. The increase for metal ore mining and solid fuels resulted mainly from increases in iron ore and coal production which had declined substantially in 1963 as a result of a strike.

Production of all metals increased 10.2 percent and crude steel gained 12.7 percent. France continued to depend on imports, either in the form of ores and concentrates or metals, to meet the bulk of its requirements of all nonferrous metals other than aluminum. Secondary producers contributed important tonnages of copper, lead, and zinc to the metal supply.

Domestic and imported ores were reduced to produce antimony, bismuth, cadmium, chromium, cobalt, magnesium, manganese, gold and silver, thorium, and uranium metals. Some of these were recovered as byproduct. Aside from bauxite, France's nonferrous ore production comprised lead-zinc ore and the complex ore from Salsigne, which contains gold, silver, copper, and bismuth. In terms of tonnage of ore, Salsigne was the second largest nonferrous ore producer after the bauxite mines.

Building industry and public works maintained their advance—368,730 dwellings were completed compared with 335,600 in 1963—favorably influencing output of construction raw materials and cement, with the latter showing a 12-percent increase.

In the energy field, production of petroleum and refined products showed a 14-percent increase over that of 1963 while solid fuels recovered from 84 percent of the 1959 output achieved in 1963 to 92 percent of the 1959 output in 1964. Increased demand for electricity (consumption increased by 8 percent, to 96 billion kilowatt-hours) favorably influenced production of fuels.

---

[4] There is some duplication between this figure and 5,752 employed in crude petroleum, natural gas, asphaltic limestone, and bituminous schist operations.

[5] Institut National de la Statistique et des Études Économiques. Annuaire Statistique 1964. Paris, France, 1965. p. 63.

TABLE 1.—France: Index of industrial production

(1959 base=100)

	1963 [1]	1964 [1]	Variation, 1963–64 (percent)
All industrial production including construction	127	138	8.7
All industrial production excluding construction	128	137	7.03
Metal ore mining	95	102	7.37
Mining and preparation of miscellaneous minerals	117	121	3.42
Metal production	118	130	10.17
Building and public works	125	142	13.6
Construction material mining	126	145	15.08
Ceramics and fabrication of building materials	131	153	16.8
Solid fuels	84	92	9.52
Petroleum and refined products	159	181	13.83
Chemical industry	152	166	9.2

[1] Monthly average of total annual production.

Source: Ministère de l'Industrie. Bulletin Mensuel de Statistique Industrielle. Paris, France, January 1965 and July 1965.

TABLE 2.—France: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Metals:					
Aluminum:					
Bauxite:					
For alumina ... thousand tons	1,932	2,053	2,058	1,911	2,329
For other uses ... do	135	172	136	118	104
Total ... do	2,067	2,225	2,194	2,029	[r] 2,433
Alumina: [1]					
Hydrated	621,986	635,005	650,206	730,617	NA
Calcined	594,251	583,514	584,701	642,658	741,000
Metal, primary	238,490	279,456	295,097	298,365	315,400
Metal, secondary	43,950	43,200	46,900	49,500	50,340
Rolled and extruded, including foil	128,245	138,700	157,100	165,000	189,300
Castings	65,100	70,800	71,400	81,400	NA
Antimony, smelter	2,170	2,265	778	703	300
Arsenic [2]	6,276	7,077	4,786	7,982	NA
Beryllium ... kilograms	21,305	6,532	8,091	3,149	7,200
Bismuth, smelter ... do	50,195	58,107	55,214	43,400	56,000
Cadmium ... do	254,000	254,000	257,000	[r] 297,000	400,000
Chromium	820	708	352	531	NA
Cobalt, smelter	533	549	631	752	750
Copper:					
Mine (metal content)	562	365	225	274	314
Secondary blister	5,348	4,364	6,227	6,458	7,600
Refined:					
Electrolytic	28,543	22,853	25,966	NA	NA
Secondary from scrap	11,641	11,598	11,545	NA	NA
Total	40,184	34,451	37,511	33,709	37,935
Gold-silver ore	118,744	124,313	136,771	150,034	149,100
Gold, content of metallurgical plant final products ... troy ounces	39,610	45,976	45,751	54,560	51,441
Iron and steel:					
Iron ore ... thousand tons	66,964	66,606	66,301	57,892	60,933
Pig iron and blast furnace ferroalloys ... do	14,145	14,566	13,959	14,306	15,863
Spiegeleisen and high carbon ferromanganese ... thousand tons	386	412	412	372	415
Other ferroalloys [3]	NA	217	250	210	NA
Steel ingots and metal for casting ... thousand tons	[r] 17,281	[r] 17,570	[r] 17,240	[r] 17,557	19,780
Rolled steel ... do	13,142	13,465	13,086	13,198	14,619
Lead:					
Ore	28,440	29,153	21,643	10,626	15,198
Contained metal in lead and zinc concentrates	18,553	18,856	14,275	8,396	[r] 11,768
Smelter	74,387	70,808	70,567	77,767	89,784
Secondary	17,457	10,790	9,107	10,202	14,475
Antimonial lead [4]	18,002	16,006	14,621	17,770	17,415
Total refined lead	109,846	97,604	94,295	105,739	121,674

See footnotes at end of table.

TABLE 2.—France: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964[p]
Metals—Continued					
Magnesium	[r] 2,143	[r] 2,075	[r] 2,120	[r] 1,743	986
Manganese:					
Ore	1,085	906	1,361	1,306	NA
Metal	936	816	1,119	925	NA
Nickel, metal content of refined nickel and nickel oxide	9,427	10,443	10,244	9,612	8,070
Silicon	15,776	19,215	16,707	15,445	21,200
Silver, content of metallurgical plant final products thousand troy ounces	3,170	2,610	2,414	3,843	3,279
Tantalum kilograms	-------	-------	445	308	NA
Thorium	199	163	74	227	NA
Tin:					
Concentrate long tons	29	220	446	370	655
Metal content do	21	156	319	276	469
Titanium	28	23	18	19	NA
Tungsten concentrate, gross weight	607	657	624	-------	-------
Uranium:					
Ore	684,352	823,796	795,503	793,829	773,000
Metal content	943	1,104	1,041	1,083	1,009
Concentrate (chemical)	1,737	3,420	4,044	4,700	4,441
Metal content	984	1,246	1,521	1,529	1,470
Metal	1,040	960	1,032	1,205	1,843
Zinc:					
Ore	31,406	28,549	31,787	25,781	25,205
Mixed concentrate (lead and zinc)	-------	-------	-------	9,514	7,411
Zinc content of zinc and lead concentrates	17,176	15,680	14,275	18,198	16,920
Zinc, refined, excluding dust	149,091	162,032	164,220	169,100	190,442
Zinc dust	3,676	4,963	4,923	4,254	4,120
Remelted zinc	31,676	31,819	31,656	33,821	[5] 42,102
Zirconium kilograms	39,037	23,200	38,500	73,300	NA
Nonmetals:					
Alabaster	1,590	1,260	1,030	1,300	NA
Asbestos	26,002	27,892	25,731	24,172	22,000
Barite	106,014	86,189	83,978	74,460	55,000
Beach pebble	107,980	159,143	198,708	193,320	NA
Bituminous and asphaltic material	99,657	100,189	106,363	109,225	NA
Building stone:					
Granite and similar rocks thousand tons	775	870	953	896	NA
Limestone do	3,373	2,977	2,636	2,886	NA
Marble do	155	180	165	199	NA
Other stones do	105	127	109	124	NA
Crushed limestone and granite do	2,119	2,414	2,464	2,812	NA
Total do	6,527	6,568	6,327	6,917	NA
Cement do	[r] 14,159	15,381	16,882	[r] 18,134	21,310
Chalk and similar calcareous rocks do	3,599	3,960	3,253	3,853	NA
Clays:					
Bentonite do	22,000	26,736	18,367	19,959	NA
Brick and tile clay do	7,723	7,557	7,902	8,555	NA
Ceramic and pottery clay	403,220	220,449	284,429	391,306	NA
Clay and marl for cement industry thousand tons	4,923	5,817	6,194	6,678	NA
Kaolin and kaolinitic clay	235,977	257,026	240,059	271,792	NA
Refractory clay thousand tons	864	1,057	893	912	NA
Diatomaceous earth	127,431	107,437	127,090	132,725	NA
Dolomite:					
For agriculture	74,760	85,649	121,533	106,177	NA
Crude for calcining	535,354	541,187	474,958	476,386	NA
Other	156,842	142,879	249,816	367,518	NA
Feldspar and pegmatites	137,505	173,205	172,924	173,504	[e] 150,000
Fluorspar	135,484	194,987	139,765	145,428	200,000
Gypsum:					
For agriculture	10,750	8,835	11,130	11,073	NA
Plaster and cement thousand tons	3,715	3,798	3,898	4,107	NA
Anhydrite	50,525	28,371	87,441	95,637	NA
Lava	5,154	10,081	10,265	10,029	NA
Lime:					
Hydraulic	968,271	801,404	770,752	739,453	NA
High-grade (fat lime) thousand tons	2,926	2,946	2,792	2,648	2,772
Limestone:					
For agriculture do	705	641	763	724	NA
For iron and steel industry do	4,501	3,917	3,994	4,317	NA
For lime and cement do	15,613	16,659	18,213	19,227	NA
For sugar mills do	517	528	544	639	NA
Total do	21,336	21,745	23,514	24,907	NA

See footnotes at end of table.

TABLE 2.—France: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Nonmetals—Continued					
Marl	179,669	230,341	305,096	215,775	NA
Mica	311	138	86	173	NA
Millstones and grindstones	1,781	1,441	1,357	1,267	NA
Mine fill thousand tons	12,427	11,499	12,073	10,212	NA
Ochre and mineral pigments	6,011	7,772	5,698	4,747	NA
Phosphatic chalk	58,024	81,500	67,442	50,423	NA
Potash, mine run ore thousand tons	9,919	10,860	11,024	11,058	11,406
K_2O equivalent of mine run ore do	1,733	1,904	1,922	1,914	1,982
Pumice	903	1,320	1,702	770	NA
Puzzalana and lapilli	431,352	440,642	473,325	545,661	579,600
Pyrite	277,093	285,438	303,954	251,322	252,310
Quartz	322,146	347,646	268,394	263,429	NA
Road building, foundation, and ballast materials (other than sand and gravel):					
Ballast thousand tons	34,497	39,914	42,392	45,965	NA
Foundation material do	1,966	2,394	2,583	3,224	NA
Paving block and curbing do	168	178	163	152	NA
Ground rock for road fillers do	535	541	475	306	NA
Total do	37,166	43,027	45,613	49,647	NA
Salt do	3,724	3,845	[r] 4,258	3,694	4,026
Sand and gravel (alluvial only):					
By dredging do	40,804	46,404	47,516	53,527	NA
By other winning methods do	21,130	23,302	27,629	33,196	NA
Total do	61,934	69,706	75,145	[8] 88,723	111,559
Sand, industrial:					
Glass do	1,127	1,105	1,236	1,211	1,124
Foundry do	1,434	1,617	1,610	1,741	1,795
Miscellaneous do	354	355	395	282	1,046
Total do	2,915	3,077	3,241	3,234	3,965
Slate:					
Roof	110,574	106,865	114,972	119,046	123,000
Other	39,401	40,668	44,145	47,156	NA
Sulfur thousand tons	[r] 796	[r] 1,108	[r] 1,355	1,409	[r] 1,521
Talc	187,785	222,648	187,000	158,121	204,000
Mineral fuels:					
Bituminous and anthracite coal thousand tons	55,966	[r] 52,363	[r] 52,369	47,762	53,030
Lignite do	2,279	2,906	2,882	2,475	2,241
Peat do	19	30	31	35	38
Coke, oven coke do	13,933	13,753	13,785	13,735	14,303
Gas coke do	695	429	247	146	
Coal briquets do	6,072	6,091	6,949	8,014	6,650
Natural gas [6] million cubic feet	[r] 156,232	[r] 212,838	[r] 247,509	[r] 265,977	[r] 280,871
Petroleum:					61
Crude thousand tons	1,976	2,163	2,370	2,522	2,845
Refinery products [7] do	29,650	34,948	37,609	44,094	50,376
Carbon black	34,900	[e] 46,000	63,000	76,200	NA

---

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Hydrated and calcined alumina are successive stages of alumina production and are not to be added.

[2] Arsenic content of final products.

[3] Ferromolybdenum, ferrotungsten, and ferrovanadium data are for contained metals.

[4] Lead content.

[5] Based on first 6-month production.

[6] Natural gas, reported at 15° C and 760 mm in France, converted to cubic feet at 60° F (15.56° C) and 14.7 p.s.i. (760 mm) by multiplying by 35.37865.

[7] Gross refinery output.

[8] Includes 2 million tons of other sand and gravel.

TRADE

The value of imports and exports of minerals and metals in 1964 were equivalent to 28.0 and 18.5 percent, respectively, of the value of total imports and exports. As in the previous years, iron and steel, including scrap, and petroleum products were the most important export items in the mineral field accounting for about 11 and 3 percent, respectively, of all French exports. Mineral fuels were the dominant imports both in tonnage and value, accounting for 53 percent of the value of mineral and metal imports and about 15 percent of all imports. France had an adverse trade balance of about $803 million for crude petroleum and petroleum products.

TABLE 3.—France: Summary of metal and mineral trade in 1964

(Thousand metric tons unless otherwise specified)

Commodity	Imports		Exports	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Iron ore, exclusive of pyrite but including pyrite cinder	3,761	39,377	22,382	79,372
Iron and steel scrap	584	22,630	1,501	53,308
Pig iron and ferroalloys, powder, shot, etc	239	24,609	376	48,547
Iron and steel	4,205	549,132	6,146	839,894
Nonferrous:				
Ore	1,844	128,132	210	5,655
Scrap	58	15,603	156	45,279
Metals including semimanufactures	478	356,135	246	158,517
Precious metals other than gold thousand troy ounces	30,328	50,466	4,112	7,868
Slags, scalings, dross other than Thomas slag	778	1,395	1,480	6,538
Thomas slag	788	7,500	343	5,359
Industrial diamonds and other natural abrasives	----------	7,981	----------	2,301
Crude fertilizers other than animal and vegetable	[1] 2,651	43,306	[2] 1,494	45,008
Nonmetals other than stone, sand, and gravel	2,352	52,338	2,230	38,141
Stone, sand, and gravel	3,603	16,273	6,209	16,595
Cement and lime	181	22,137	1,010	16,577
Mineral fuels:				
Coal, coke, peat and briquets	20,441	421,575	1,003	16,745
Petroleum:				
Crude	49,275	919,046	----------	----------
Refinery products	4,954	152,741	8,616	268.989
Natural and manufactured gas	182	7,822	326	9,772
Total	74,852	1,501,184	9,945	295,506
Grand total	126,704	2,838,198	57,840	1,664,465

[1] Includes 64,209 tons of chemically treated potassic fertilizer to make it comparable with exports (see footnote 2 below).

[2] Includes 1,403,000 tons of chemically treated potassic fertilizer, because potash exports of France are substantially in this form.

Source: United Nations, Commodity Trade Statistics 1964, Statistical Papers, Series D, V. 14, No. 1-14 New York, 1965, 222 pp.

As in the previous years, the other countries of the European Economic Community (EEC)[6] and the countries of the European Free Trade Association (EFTA)[7] were France's most important trading partners. In 1964, 38.8 percent of all exports of France were to other EEC countries and 55.4 percent to these as well as EFTA countries. The corresponding import figures were 37.4 percent from EEC countries and 48.9 percent from EEC and EFTA countries combined. For the minerals and metals tabulated, France's exports to other EEC nations were 50.1 percent and to the EFTA countries 22.8 percent of the total. For the same commodities, imports from the EEC countries were 36.9 percent and from the EFTA countries 4.7 percent of the total.

---

[6] The EEC includes Belgium, France, Italy, Luxembourg, the Netherlands, and West Germany.

[7] The EFTA includes Austria, Denmark, Norway, Portugal, Sweden, Switzerland, and the United Kingdom.

In 1963, iron ore, iron and steel, sulfur, crude potash as well as stone, sand, gravel, and crushed stone were the principal mineral and metal exports of France to other EEC countries. This area also took a substantial share of France's export of bauxite, aluminum, copper ingot, cadmium, lead, silver, slab zinc, and a number of nonmetallics such as chalk and clays. French steel exports to this market was equivalent to 68.9 percent of France's steel exports to all destinations in value. On a value basis, Switzerland was the largest market for French petroleum followed by West Germany, Algeria, and the United Kingdom. The United Kingdom together with other EFTA countries, received 51 percent of France's sulfur exports.

Iron and steel, solid fuels, copper, lead, and zinc were France's principal imports from its Common Market partners. Algeria was the largest single supplier of crude petroleum. These imports, valued at $332 million, accounted for 54 percent of all imports from Algeria. Phosphate and metallic ores were imported from Morocco. In 1964 these were valued at $52 million, equivalent to 22.7 percent of the value of all imports of France from Morocco.

In 1964, imports of all base nonferrous metals and semimanufactures, ores, and scrap were valued at $500 million, compared with $377 million in 1963. Precious metal imports, other than gold, added another $50.5 million to the total. The $123 million increase in imports resulted mainly from increased imports of lead and zinc ores needed to satisfy the greater smelting capacity of the country and from higher prices paid for copper, lead, tin, and zinc. Also, in the case of copper and copper alloy ingots and semimanufactures, a larger quantity was imported (274,726 tons against 231,338 tons in 1963).

Imports of these copper materials in 1964 were valued at $201 million; corresponding figures for other principal metals were as follows in million dollars: aluminum 50.4; tin 39.0; nickel 22.6; lead 15.4; zinc 8.2. French exports of nonferrous metals, semimanufactures, ores, and scrap were valued at $209.5 million in 1964. The most important items were aluminum and copper, as metal and semimanufactures, and scrap metals. Main recipients were the EEC countries for aluminum, copper, and scrap metals, and the United States for aluminum.

France's exports in 1964 to the United States comprised iron and steel, aluminum, antimony, chromium, cobalt, nickel matte, and potash. Principal imports from the United States were coal, boron minerals, silver, and copper.

TABLE 4.—France: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	EEC	Principal destinations, 1963
Metals:				
Aluminum:				
Aluminum oxide and hydroxide	181,202	183,910	10,626	Switzerland 72,855; Spain 87,490.
Bauxite	266,628	205,901	139,735	West Germany 135,351; United Kingdom 59,044.
Ingots	105,184	124,691	83,930	Belgium-Luxembourg 69,792; United States 28,856; Netherlands 6,990.
Scrap	7,317	12,368	12,328	Italy 6,688; West Germany 5,093.
Semifabricated	29,201	33,269	13,424	United States 5,485.
Antimony	82	266	80	United States 113; Italy 50; Belgium-Luxembourg 30.
Beryllium, including semifabricated	3	3	NA	NA.
Bismuth	45	47	---------	Greece 47.
Cadmium	22	65	63	Belgium-Luxembourg 46; Italy 9; Netherlands 8.
Chromium	192	277	62	United States 172; West Germany 51; U.S.S.R. 33.
Cobalt	443	458	72	United States 340; West Germany 39; Netherlands 30; Japan 22.
Copper:				
Matte	428	891	870	West Germany 496; Italy 247; Belgium-Luxembourg 127.
Scrap	22,692	33,576	25,444	Belgium-Luxembourg 9,509; Italy 9,464; West Germany 6,346.
Ingots, including alloys	[r] 17,991	17,409	16,841	West Germany 7,628; Belgium-Luxembourg 6,029; Italy 3,164.
Semifabricated	[r] 17,732	18,723	4,455	United States 3.094; Switzerland 1,826; Spain 1,163.
Iron:				
Ore thousand tons	25,683	21,204	20,940	Belgium-Luxembourg 14,077; West Germany 6,683; United Kingdom 264.
Pyrite cinder do	361	344	292	West Germany 234; Belgium-Luxembourg 57; United Kingdom 52.
Scrap do	1,190	1,195	1,188	Italy 1,131; West Germany 41; Belgium-Luxembourg 14.
Pig iron, spiegeleisen, iron and steel powders and ferroalloys. do	439	359	293	Belgium-Luxembourg 162; West Germany 80; Italy 46; United States 42.
Ingots, blooms and billets. do	[r] 277	387	255	Italy 172; United Kingdom 62; West Germany 46; Switzerland 37.
Rolled steel do	[r] 4,323	4,289	2,048	West Germany 1,193; Italy 570; United States 301; Switzerland 286; Belgium-Luxembourg 182; Netherlands 103; Spain 80; U.S.S.R. 56; United Kingdom 52; Middle East and Africa 643.
Iron and steel tubes and pipes. do	526	544	53	Switzerland 68; United States 60; West Germany 18; Middle East and Africa 186.
Iron and steel castings	3,334	3,118	1,297	West Germany 636; Switzerland 302; Italy 279; Cameroon 204.
Lead:				
Ore and concentrate	4,914	125	NA	NA.
Scrap	7,551	8,369	8,369	Italy 7,876; Belgium-Luxembourg 339.
Pig	5,484	19,267	15,565	West Germany 15,236; Switzerland 2,968.
Semifabricated	770	423	85	Algeria 88; Senegal 81; Tunisia 75.
Magnesium:				
Scrap	58	59	NA	NA.
Ingots	5	34	---------	Norway 32.
Wrought	19	14	---------	Israel 9.
Manganese:				
Ore and concentrate	1,622	1,840	1,255	Italy 998; Switzerland 458.
Metal	20	202	83	West Germany 83; Poland 82.
Mercury 76-pound flasks	319	348	NA	Upper Volta 232.
Molybdenum, all forms	11	18	5	United States 4; U.S.S.R. 4.
Nickel:				
Matte and speiss	412	1,220	613	West Germany 603; United States 591.
Scrap	1,095	3,099	529	Caledonia 2,236; West Germany 242; United Kingdom 204.
Ingots	5,351	5,582	769	U.S.S.R. 3,002; West Germany 479; Austria 440; mainland China 400; Poland 375; United States 182.
Semifabricated (including anodes).	[r] 983	1,073	416	Spain 226; West Germany 184; United States 105; Sweden 102.

See footnote at end of table.

TABLE 4.—France: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	EEC	Principal destinations, 1963
Metals—Continued				
Platinum____troy ounces__	31,861	61,086	12,860	Brazil 16,075; Switzerland 16,075; Spain 6,430; Netherlands 6,430.
Silver:				
Waste and sweepings of silver and platinum metals.	28	21	12	West Germany 12; Sweden 9.
Ingots thousand troy ounces__ or partly worked.	5,144	2,884	1,730	Netherlands 608; West Germany 569; Belgium-Luxembourg 550; Switzerland 479; United Kingdom 318.
Tin:				
Ore and concentrate__long tons__	464	371	---------	Spain 355.
Scrap____do____	39	11	11	Netherlands 8.
Ingots____do____	156	93	---------	Switzerland 20; Algeria 16.
Semifabricated____do____	131	104	---------	Tunisia 36; Algeria 17.
Titanium metal____	4	21	NA	NA.
Tungsten:				
Ores and concentrates____	486	108	77	West Germany 77; United Kingdom 28.
Metal____	67	75	27	West Germany 25; Austria 13.
Uranium and thorium kilograms__ (including alloys).	1,000	300	300	Italy 300.
Vanadium and molybdenum ores___	521	404	390	West Germany 233; Netherlands 150.
Zinc:				
Ore and concentrates____	7,282	499	---------	Norway 499.
Scrap____	300	1,331	1,331	Italy 1,328.
Dust____	1,185	1,362	---------	Norway 1,350.
Slab____	4,813	14,573	11,147	West Germany 7,213; Italy 3,391; Japan 1,673.
Semifabricated____	2,600	3,270	2,180	West Germany 2,148; Turkey 302.
Other nonferrous ores and concentrates.	249	432	NA	Spain 249.
Other base metals____	15	7	NA	NA.
Nonmetals:				
Asbestos____	10,062	6,175	2,919	West Germany 1,428; Belgium-Luxembourg 1,399; Argentina 1,056; Algeria 819.
Asphalt and bitumen (natural)____	21,400	20,506	NA	United Kingdom 20,476.
Barite____	18,351	10,876	2,978	Algeria 2,653; Nigeria 1,987; Belgium-Luxembourg 1,473; Netherlands 1,005.
Borates, natural____	124	354	---------	Morocco 240.
Building stones, marble, dimension stones, slate, granite, sandstone and other.	117,324	134,690	117,953	Belgium-Luxembourg 68,098: West Germany 38,949.
Cement____thousand tons__	1,263	1,081	340	West Germany 248; Spain 72; Middle East and Africa 520.
Chalk____	208,941	232,278	204,332	West Germany 99,554; Belgium-Luxembourg 60,803; Netherlands 26,364; Italy 17,611.
Clays____	[r]391,009	406,994	374,472	Italy 188,227; West Germany 129,801; Belgium-Luxembourg 52,385.
Diamond, including powder. thousand dollars_	1,294	1,084	NA	NA.
Diatomaceous earth____	14,663	12,191	10,237	West Germany 8,416.
Other natural abrasives____	667	556	489	West Germany 466.
Dolomite, including calcined____	24,430	25,465	14,280	West Germany 8,486; Belgium-Luxembourg 5,694.
Earth pigments____	6,261	5,734	2,367	Netherlands 1,301; West Germany 628; Morocco 501.
Feldspar, fluorspar, etc____	57,835	66,051	45,567	West Germany 29,921; Belgium-Luxembourg 14,222.
Fertilizers:				
Natural phosphate____	1,228	2,859	288	Austria 1,520; Switzerland 736.
Natural sodium nitrate____	265	446	---------	Tunisia 208.
Potash (crude)____	139,875	73,199	69,636	Belgium-Luxembourg 42,971; Netherlands 25,581.
Potassic fertilizers (chemical). thousand tons__	1,130	1,239	337	Belgium-Luxembourg 199; United Kingdom 198; United States 143; Japan 123; Switzerland 71; Ireland 60; Netherlands 57; Ceylon 41.
Graphite____	1,185	1,767	910	United Kingdom 454; Italy 402; West Germany 341.
Gravel and crushed stone. thousand tons__	2,123	3,019	2,035	West Germany 1,689; Switzerland 942; Belgium-Luxembourg 233; Netherlands 109.

See footnotes at end of table.

TABLE 4.—France: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	EEC	Principal destinations, 1963
Nonmetals—Continued				
Gypsum and plaster	684,229	648,147	408,739	Belgium-Luxembourg 332,498; Sweden 97,736; United Kingdom 46,301.
Calcareous stone	223,995	170,378	117,445	West Germany 75,827; Belgium-Luxembourg 41,618.
Lime	106,740	115,747	95,489	West Germany 61,526; Belgium-Luxembourg 33,928.
Magnesite	821	442	200	Italy 180; Gabon 218.
Mica	164	99	19	Spain 28.
Quartz and quartzite	1,448	2,242	1,394	Italy 596.
Salt	104,748	137,226	121,404	Belgium-Luxembourg 92,235; West Germany 16,019; Netherlands 13,150.
Sand thousand tons	1,061	1,033	627	Switzerland 381; West Germany 355; Italy 159; Belgium-Luxembourg 113.
Sulfur do	547,042	1,013	264	United Kingdom 198; West Germany 142; Netherlands 79; Hungary 66; Sweden 51; Belgium-Luxembourg 43; Portugal 33.
Other minerals	206,502	148,271	NA	NA.
Slags:				
From iron and steel furnaces	862,535	970,017	921,141	West Germany 696,014; Belgium-Luxembourg 208,125.
Other	34,846	19,499	9,956	Switzerland 9,542.
Talc	44,819	49,624	18,498	West Germany 11,417; Switzerland 9,148; United Kingdom 8,722.
Mineral fuels:				
Coal thousand tons	1,361	1,003	751	West Germany 536; Switzerland 240; Belgium-Luxembourg 168.
Coal briquets do	[r] 31	14	7	Switzerland 7; Italy 5.
Coke do	[r] 57	51	25	Switzerland 23; Italy 12.
Petroleum and refinery products:				
Gasoline thousand tons	1,435	1,396	223	Switzerland 376; Algeria 309; West Germany 209; United Kingdom 205.
Kerosine do	607	860	65	United States 127; United Kingdom 97; Switzerland 97; Greece 32; Spain 16.
Distillate fuels do	2,843	2,606	806	Switzerland 718; West Germany 482; Algeria 411; United Kingdom 302; Belgium-Luxembourg 170; Netherlands 152.
Residual fuel oils do	1,800	2,326	844	West Germany 568; United Kingdom 295; Algeria 272; Netherlands 254; Switzerland 188; Spain 107.
Lubricating oils do	192	225	61	NA.
Wax and petroleum do	11	11	5	Morocco 4; Italy 3.
Other do	237	313	104	Algeria 56; Switzerland 48; West Germany 48.
Total do	7,125	7,737	2,108	

NA Not available. [r] Revised.

TABLE 5.—France: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	EEC	Principal sources, 1963
Metals:				
Aluminum:				
Alumina, calcined	195,002	126,794	160	Guinea, 101,020; United States 25,579.
Bauxite	101,838	142,499	303	Greece 94,310; British Guinea 27,866; Surinam 19,898.
Ingots	51,565	55,870	295	Cameroon 45,535; United States 6,036; Canada 3,217.
Scrap	1,328	2,295	1,279	Belgium-Luxembourg 1,105; Algeria 693.
Semifabricated	7,763	12,417	8,815	West Germany 5,058; Belgium-Luxembourg 2,553; Switzerland 886; Netherlands 798.
Antimony:				
Ore	3,004	867	--------	South Africa 490; mainland China 196; Thailand 117.
Metal	2,175	2,787	143	Mainland China 1,688; U.S.S.R. 671; Belgium-Luxembourg 142.
Beryl	601	122	--------	NA.
Bismuth	565	665	147	United Kingdom 404; Netherlands 84; Japan 68; Belgium-Luxembourg 63.
Cadmium	853	807	365	Belgium-Luxembourg 329; Republic of the Congo (Léopoldville) 120; United States 120.
Chromium ore and concentrate	160,820	153,662	853	U.S.S.R. 58,042; Turkey 40,066; New Caledonia 19,663; Iran 16,643.
Cobalt:				
Concentrate	9,695	10,522	--------	Morocco 748.
Metal	180	270	157	Belgium-Luxembourg 154; Republic of the Congo (Léopoldville) 55; United States 33.
Columbium-tantalum ore	89	72	NA	NA.
Copper:				
Scrap	9,035	8,507	3,040	Algeria 3,974; Belgium-Luxembourg 1,663; West Germany 1,225.
Matte	--------	50	30	West Germany 20; United Kingdom 20.
Ingots and refined, including alloys.	233,735	220,600	90,350	Belgium-Luxembourg 84,828; Federation of Rhodesia 38,158; United States 33,084.
Semifabricated	6,192	10,738	8,179	West Germany 3,176; Belgium-Luxembourg 2,768; United Kingdom 1,184.
Iron and steel:				
Ore ....thousand tons	1,896	3,478	271	Liberia 751; Brazil 674; Sweden 627 Mauritania 434; Belgium-Luxembourg 266.
Pyrite cinder	18,968	27,295	21,310	Italy 17,126; Spain 5.985; Belgium-Luxembourg 4,184.
Scrap	367,102	577,196	437,267	Belgium-Luxembourg 271,032; West Germany 118,666; United Kingdom 114,792.
Pig iron, spiegeleisen and high-carbon ferromanganese. thousand tons	[1] 180	[1] 233	186	West Germany 105; Belgium-Luxembourg 45.
Other ferroalloys ....do	15	23	4	Caledonia 20; Norway 3.
Ingots, blooms and billets and coils for rerolling. do	964	1,138	972	West Germany 550; Belgium-Luxembourg 370; U.S.S.R. 62; United Kingdom 52.
Rolled steel.....thousand tons	[r] 2,195	2,397	2,263	West Germany 1,270; Belgium-Luxembourg 906; United Kingdom 67; Italy 46; Netherlands 41.
Iron and steel pipes including cast iron pipes. do	117	104	86	West Germany 72; Belgium-Luxembourg 10.
Castings	509	1,033	885	West Germany 583; Belgium-Luxembourg 281.
Lead:				
Ore and concentrate	97,637	132,271	2,285	Morocco 69,999; Australia 22,683; Canada 22,672.
Scrap	2,351	4,002	1,562	Algeria 2,019; Belgium-Luxembourg 1,274.
Pig	67,392	67,789	28,492	Belgium-Luxembourg 22,620; Morocco 16,788; Tunisia 13,065.
Semifabricated	168	239	202	West Germany 122; Belgium-Luxembourg 80.

See footnotes at end of table.

TABLE 5.—France: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	EEC	Principal sources, 1963
Metals—Continued				
Magnesium:				
Scrap	21	12	----------	NA.
Ingots	1,176	1,848	324	United States 651; Norway 340; Canada 299; Italy 299; United Kingdom 234.
Wrought	48	103	33	Canada 30; United States 27; West Germany 15.
Manganese:				
Ore and concentrate	717,285	712,299	926	Morocco 227,945; Republic of South Africa 199,734; U.S.S.R. 112,867.
Metal	20	968	----------	Republic of South Africa 910.
Mercury 76-pound flasks	14,968	15,319	8,965	Italy 8,702; Spain 5,222.
Molybdenum:				
Ore	3,241	4,620	----------	United States 3,996; Peru 367.
Metal	28	37	15	Austria 12; West Germany 11; United States 9.
Nickel:				
Matte	13,770	12,703	6	Caledonia 12,090; Canada 454.
Scrap	1,670	1,834	503	West Germany 357; United Kingdom 202; Switzerland 112.
Ingots	4,127	4,887	29	United Kingdom 4,192; Canada 566.
Semifabricated including anodes	1,739	1,757	399	United Kingdom 876; West Germany 307; Switzerland 216.
Platinum and platinum group metals troy ounces	163,841	170,390	16,075	U.S.S.R. 109,312; United Kingdom 32,151.
Silver:				
Crude thousand troy ounces	18,813	26,544	6,064	United Kingdom 8,626; United States 6,797; West Germany 2,447; Belgium-Luxembourg 1,749.
Semifabricated do	587	276	276	West Germany 270.
Waste and sweepings of silver and platinum group metals. kilograms	24,994	82,300	1,900	Spain 76,600.
Thorium and uranium ores and concentrates.	3,226	3,000	----------	Gabon 1,402; Malagasy 1,112; Australia 486.
Tin and tin alloys:				
Scrap long tons	59	86	24	Switzerland 60; Netherlands 24.
Ingots do	11,273	11,049	3,962	Federation of Malaysia 3,693; Belgium-Luxembourg 3,156; United Kingdom 1,312.
Semifabricated do	25	27	9	United Kingdom 17; Belgium-Luxembourg 4.
Titanium:				
Ore	81,997	96,618	----------	Federation of Malaysia 65,997; Senegal 12,127.
Metal	178	269	----------	United States 170; Japan 64.
Tungsten:				
Ore and concentrate	2,010	2,191	----------	Brazil 650; U.S.S.R. 481; South Korea 368.
Metal, all forms	39	41	17	United Kingdom 16; Netherlands 12.
Vanadium ore	256	----------	----------	
Zinc:				
Ore and concentrate	297,917	281,073	27,282	Algeria 67,769; Morocco 45,391; Peru 19,313; Spain 16,833.
Scrap	10,711	13,368	12,408	Netherlands 8,137; Belgium-Luxembourg 3,544.
Dust	4,150	4,078	4,009	Belgium-Luxembourg 3,997.
Slab	32,423	20,625	12,925	Belgium-Luxembourg 10,807; Federation of Rhodesia 2,946; Norway 2,390.
Semifabricated	588	2,557	2,055	Belgium-Luxembourg 1,642; West Germany 410; Yugoslavia 377.
Zirconium ore	18,940	19,685	----------	Australia 16,921; Senegal 2,735.
Other nonferrous ores and concentrates.	2,229	3,597	NA	NA.
Nonferrous metalliferous wastes	16,175	11,619	7,293	Belgium-Luxembourg 3,628; West Germany 2,862; Spain 2,285.
Other metals (chromium, germanium, hafnium, vanadium, zirconium, uranium and gallium).	15	19	NA	NA.

See footnotes at end of table.

TABLE 5.—France: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	EEC	Principal sources, 1963
Nonmetals:				
Asbestos	97,420	74,528	4,646	Canada 39,639; U.S.S.R. 17,538; Republic of South Africa 8,611.
Asphalt and bitumen (natural)	2,099	2,188	---------	United States 1,313.
Barite	51,731	66,437	57,178	West Germany 57,019; Spain 5,145.
Borates, natural	32,542	39,743	---------	Turkey 24,735; United States 15,008.
Building stones (marble, slate, dimension stone, granite, sandstone, and other).	65,326	75,394	35,461	Italy 30,330; Republic of South Africa 10,941.
Cement	30,013	67,957	55,783	Belgium-Luxembourg 32,203; West Germany 13,174; Italy 10,401.
Chalk	6,433	8,961	8,949	Belgium-Luxembourg 8,770.
Clays:				
Kaolin, including calcined	151,966	184,211	160,654	United Kingdom 171,021; West Germany 125,618; Algeria 35,933.
Refractory	154,844	151,456		
Bentonite	86,087	91,857		
Other	15,668	3,840		
Crushed rock and gravel. thousand tons	975	1,507	1,505	Belgium-Luxembourg 1,464; Italy 23; West Germany 18.
Cryolite, natural	1,425	1,261	---------	Denmark 1,240.
Diamond:				
Industrial thousand dollars	4,676	4,026	1,369	Belgium-Luxembourg 962; Ireland 931; United Kingdom 854; Netherlands 399.
Powder do	2,094	2,524	1,235	United Kingdom 938; Belgium-Luxembourg 650; Netherlands 568.
Diatomaceous earth	10,669	8,964	2,036	Algeria 5,062; United States 1,722; West Germany 1,188.
Other natural abrasives	32,743	34,992	33,001	Italy 18,691; West Germany 13,568.
Dolomite	189,926	185,111	171,252	Belgium-Luxembourg 164,610; West Germany 6,636.
Earth pigments	665	1,056	766	West Germany 275; Spain 237.
Feldspar, leucite, and fluorspar	10,248	9,461	6,775	West Germany 6,374; Norway 2,043.
Fertilizer raw materials:				
Natural sodium nitrate	64,890	49,841	---------	Chile 49,824.
Rock phosphate. thousand tons	2,117	2,235	38	Tunisia 495; Senegal 117; Algeria 95.
Potassic fertilizer (chemical)	47,963	54,209	54,209	Belgium-Luxembourg 48,526.
Graphite	4,855	5,094	1,512	Malagasy 3,087; Italy 1,084.
Gypsum and plaster	20,825	17,132	16,380	West Germany 14,705; Italy 993; Belgium-Luxembourg 682.
Lime	106,004	77,224	76,319	Belgium-Luxembourg 62,231; West Germany 14,069.
Limestone (calcareous stone)	141,587	156,315	156,315	Belgium-Luxembourg 152,508.
Magnesite	28,636	26,292	1,277	Austria 12,433; Greece 5,940.
Mica	3,324	3,627	---------	India 1,643; Norway 926.
Pyrite	439,317	395,622	---------	Spain 205,603; Cyprus 124,011; Portugal 30,734.
Quartz and quartzite	4,620	9,993	9,457	Belgium-Luxembourg 5,497; West Germany 2,775.
Salt	77,749	62,710	9,351	Algeria 35,721; Tunisia 17,487.
Sand thousand tons	1,053	1,225	1,223	Belgium-Luxembourg 640; Netherlands 539; West Germany 44.
Soapstone and talc	7,012	8,680	5,056	Italy 5,053; Austria 1,728.
Sulfur	147,509	115,022	651	Mexico 67,928; United States 46,420.
Other mineral materials	813,306	703,079	21,477	Switzerland 666,776; West Germany 14,606.
Slags and ashes:				
From iron and steel furnaces	704,924	680,286	680,286	West Germany 435,377; Belgium-Luxembourg 240,948.
Other slags and ashes	39,103	70,371	70,371	West Germany 42,999; Belgium-Luxembourg 26,341.
Mineral fuels:				
Coal thousand tons	10,807	15,584	8,119	West Germany 6,119; United States 2,577; United Kingdom 2,124; U.S.S.R. 1,836; Netherlands 1,066.
Coal briquets do	520	818	772	Belgium 476; Netherlands 212; West Germany 84.
Coke do	4,694	5,916	5,889	West Germany 4,552; Netherlands 975; Belgium 347.
Lignite briquets do	487	495	478	West Germany 470.

See footnotes at end of table.

TABLE 5.—France: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	EEC	Principal sources, 1963
Mineral fuels—Continued				
Petroleum:				
Crude..........thousand tons..	37,160	43,258	....	Venezuela 2,649; Iran 2,038; Saudi Arabia 1,793; Libya 1,661; Qatar 1,194.
Refinery products:				
Gasoline..................	761,324	699,971	120,260	Venezuela 160,240; Rumania 134,680; Algeria 79,797; Italy 68,498; Netherlands 37,110.
Kerosine and white spirit...	6,995	20,302	4,825	Kuwait 8,317; Italy 3,662; Iraq 3,540.
Distillate fuels. thousand tons..	1,112	1,735	168	U.S.S.R. 402; Algeria 345; Rumania 311; Venezuela 131; Italy 80; Iraq 73.
Residual fuels.........do....	717	1,269	143	U.S.S.R. 412; Rumania 299; Kuwait 138; Venezuela 112; Netherlands 65; Iraq 56.
Lubricating oils and greases.	20,657	23,266	5,472	United States 14,254; West Germany 3,009; United Kingdom 2,509; Netherlands 1,304.
Mineral waxes.............	53,463	100,054	2,485	Indonesia 55,516; United Kingdom 29,290.
Petrolatum................	682	706	172	Netherlands 90; West Germany 82.
Pitch, resin, petroleum asphalt, coke, etc.	486,767	760,468	232,742	United States 278,199; West Germany 173,974; United Kingdom 117,388; U.S.S.R. 113,740.
Total petroleum products. thousand tons..	3,159	4,608	678	
Gas, natural and manufactured.	166,627	214,511	182,132	West Germany 130,405; Belgium-Luxembourg 38,928; Algeria 18,173.

---

[r] Revised. NA Not available.

[1] Including 5,323 tons of iron and steel, powder, shot, and similar products in 1962 and 5,676 tons in 1963.

COMMODITY REVIEW

METALS

Bauxite and Alumina.—Of the 1964 bauxite output Péchiney, Compagnie de Produits Chimiques et Électrométallurgiques produced 1,278,000 tons. The largest producing area was Var, contributing 80 percent of the output. Péchiney continued exploration in the Var and Herault areas, discovering several pockets of good quality bauxite in the Villeveyrac basin of the Herault area. Official price of red bauxite, 54 to 55 percent Al_2O_3, f.o.b. railroad cars, was fixed on August 1, 1959, at $3.58 per ton and has not changed since.

French bauxite consumption in 1964 totaled 2,361,500 tons distributed as follows: alumina production 2,099,500 tons, abrasive production 94,000 tons, refractories 26,000 tons, and cement, 142,000 tons.

Calcined alumina production showed an increase of 15.3 percent, and total French output capacity is expected to reach 870,000 tons per year. Péchiney started expansion of the Gardanne alumina plant to bring its daily capacity from 1,110 to 1,400 tons by 1966. From 1967 on, this plant should receive part of its bauxite requirements from Australia, where the company has an agreement with Comalco Industries Pty. Ltd. for delivery of 50 million tons of bauxite over a period of 20 years.

Aluminum.—France was the fourth largest world aluminum producer accounting for 26.3 percent of the West European output in

1964. Péchiney produced 248,793 tons of the year's output; presumably the Société d'Électro-Chimie, d'Électro-Métallurgie et des Aciéries Électriques d'Ugine (Ugine) produced the remainder. Capacity at the end of the year probably was 325,000 to 330,000 tons per year. Semifinished production (shipments) totaled 189,300 tons distributed as follows: sheet and strip 108,604; rounds 22,292; bars and sections 25,763; pipes 7,250; wire 22,780; forgings 2,611.

Aluminum consumption (primary and secondary) during the year totaled 249,275 tons with principal consumers as follows in percent: Transport vehicles and equipment 32.4; electrical equipment 12.4; domestic and office equipment 11.5; packaging 10.1; mechanical equipment 8.4; buildings 8.2; and other 17.0.

As previously, all aluminum sales were handled by L'Aluminium Français. Shipments by this organization in terms of contained aluminum totaled 356,760 tons including 45,782 tons,[8] the French share of aluminum produced by Compagnie Camérounaise de l'Aluminium in Cameroon. Aluminium prices at yearend varied from $489.16 to $535.74 per ton depending on quality.

In 1964 France exported 86,780 tons of aluminum ingots and 38,384 tons of aluminum alloys, quantities which were not much different from those of 1963. Semimanufacture exports totaled 42,458 tons. Imports of ingot aluminum from all sources other than Cameroon totaled 72,438 tons and of semimanufactures 16,258 tons.

Péchiney started expansion of its aluminum production facilities to raise capacity by about 30,000 tons per year; by 1965 the company plans to have 280,000 tons annual capacity, bringing total French capacity to the 345,000-ton target envisaged in the Government's fourth plan. Péchiney's expansion in its various plants will be as follows: Noguères 13,000; Rioupéroux 9,000; l'Argentière 2,200, Chedde 1,200, and Sabart 1,800.

Work on the first section of the cold rolling mills of Rhenalu was completed. Rhenalu is a subsidiary of Compagnie Générale du Duralumin et du Cuivre (Cégédur). Péchiney and Ugine own more than 50 percent of Cégédur.

Copper.—Consumption of refined copper (primary and secondary) was 291,600 tons compared with 250,300 tons in 1963. Consumption requirements were met primarily by imports which totaled 259,629 tons of unwrought and 15,096 tons of wrought copper. Production of semifinished copper, in terms of metal content, totaled about 405,000 tons including 243,000 tons of sheets, strips, bars, and wire of unalloyed copper; 101,000 tons of similar products in brass; 8,000 tons of other copper alloys; 36,500 tons of copper and copper alloy castings; and 11,200 tons of copper salts. Consumption of scrap for 1964 is not available; in 1963 it amounted to 113,200 tons of copper content.[9]

Prices of copper, supplied by Groupement d'Importation et Répartition des Métaux, a private, Government-approved organization for importation and distribution of copper, increased from about $652 per ton at the beginning of the year to $747 in December 1964.

---

[8] Péchiney. Rapport Annuel 1965. Paris, France. 1965, p. 10.

[9] Metalgesellschaft A.G. Metal Statistics 1954–63. Frankfurt, West Germany, 1964, p. 131.

Iron Ore and Ferroalloy Ores.—French iron mines increased their output by 5.3 percent in 1964, and France maintained its position as the largest iron ore producer in the EEC and the third largest world producer in terms of gross tonnage produced. The Briey, Longwy, and Nancy basins of Lorraine again accounted for 94 percent of total output, as they did in 1963. Imports of high-grade iron ore to meet part of the needs of the steel plants of the north and to supply ore for production of hematite and semihematite pig iron continued to increase. In 1964, shipment of foreign ores to French mills constituted 8.5 percent of all iron ore shipments compared to 6.5 percent in 1963 and 3.9 percent in 1962. Mauretania was the largest source of iron imports (996,354 tons), followed by Liberia (814,744 tons), Sweden (478,011 tons), Brazil (393,835 tons), and Peru (239,283 tons).

Although imports of iron ore from France by other EEC countries in 1964 (21,640,000 tons) were almost the same as in 1963 (21,104,000 tons), the French share of this market was only 31 percent compared with 36 percent in 1963. Belgium, Luxembourg, and the Saar region of West Germany were the principal importers in the order given. Average published prices of Lorraine ore were $3.17 per ton for calcareous ore with 31 percent Fe and $3.01 per ton for silicious ore with 32 percent Fe.

TABLE 6.—France: Marketable iron ore production by basin, total iron ore shipments and stocks

(Thousand metric tons)

	1960	1961	1962	1963	1964
Production:					
Lorraine	62,725	62,400	62,422	54,377	57,455
West (Normandy and Anjou)	3,849	3,881	3,646	3,412	3,395
Pyrénées	354	300	203	75	83
Other basins	36	25	30	28	----------
Total	66,964	66,606	66,301	[r] 57,892	60,933
Iron content	19.957	19,708	19,706	[r] 17,399	NA
Shipments:					
Domestic	39,416	40,153	38,347	[r] 36,374	38,700
ECSC [2] countries	26,310	25,568	25,699	21,341	[1] 21,800
Other destinations	519	424	325	267	200
Total	66,245	66,145	64,371	[r] 57,982	60,700
Stocks	5,739	6,151	8,059	7,711	7,700

[r] Revised. NA Not available.

[1] Includes Belgium-Luxembourg 15,400; West Germany 6,400; and United Kingdom 200.

[2] The ECSC includes Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands.

Number of operating mines and ownership of these mines presumably remained essentially as described in the previous volume. Productivity in mines of Lorraine increased to 16.4 tons per man-shift (surface and underground) compared with 12.4 tons in 1960. By 1970 the so-called Fifth Plan of Development envisages an increase of productivity of the Lorraine mines to 24 tons per man-shift and of the western mines to 11 tons, compared with 8 tons for the western mines in 1964.

Of the ferroalloy ores, France has produced only tungsten in the past and is now dependent on foreign sources for this and all other ferroalloy ores. Manganese ore and chromite are the most important ferroalloy ores imported. Imports of manganese ore, 791,195 tons, was 14.9 percent more than in 1963. Imports from Gabon increased to 171,500 tons. Chromite imports, 193,394 tons, were 12.6 percent larger than in 1963. The U.S.S.R., Turkey, Iran, and Greece were principal suppliers in the order given.

The iron and steel industry consumed 678,100 tons of manganese ore. Total chromite consumption was 182,000 tons, compared with 158,000 tons in 1963. Increase in production of alloy and stainless steel caused a corresponding increase in the consumption of nickel, chromium, and molybdenum but because of reduction in output of high-speed steels, tungsten consumption dropped.

Iron and Steel.—*Production.*—Production of pig iron and crude steel attained their highest recorded levels in 1964. Pig iron output increased 10.8 percent and crude steel production rose 12.7 percent above the 1963 level. However, France's share of world steel output remained the same as in 1963, about 4.5 percent, with the country ranking sixth among world producers and second to West Germany in the EEC. France accounted for almost 23.9 percent of the Community's crude steel output. Although output of Thomas pig iron remained dominant, the share of hematite pig iron, obtained from high-grade imported ore, increased to 8.2 percent (5.5 percent in 1963). As a result, average slag per ton of pig iron produced decreased from 917 kilograms in 1963 to 878 kilograms in 1964. To reduce coke consumption in blast furnaces, fuel oil injection was increased by 65 percent compared with 1963 and consumption of the fuel oil by the industry as a whole increased 15 percent.

Geographical pattern of pig iron production remained the same as in 1963. Of the 98 blast furnaces in operation on December 31, 1964, 74 were in the east, 14 in the north, 5 in the southwest, 1 in southeast, and 4 on the western districts.

Thomas steel and open-hearth steel constituted 53.6 and 26.2 percent, respectively, of 1964 total crude steel output. The share of oxygen steel increased significantly to 11.2 percent (7.6 percent in 1963), but use of oxygen furnaces was not yet as widespread as in other major steel producing countries such as West Germany and Japan.

Production of special and alloy steel amounted to 1,549,000 tons, 7.8 percent of total crude steel output. Of this structural high-grade carbon steel represented 37.8 percent, structural alloy steel 37.2 percent, ball-bearing steel 5.2 percent, and stainless steel 15.1 percent. Stainless steel production increased to 234,000 tons from 212,000 tons in 1963.

Composition of rolled steel output varied little from the previous year although the increase in heavy plate production was above the average increase for all rolled steel. Share of flat products remained at about 50 percent.

Facilities and Investment.—In 1964, 82 firms were engaged in ingot steel production and six of these accounted for 70 percent of the output. Geographical distribution of steel output did not alter appreciably during the year; however, operation of the Dunkirk plant increased the output of the north district to 5,262,167 tons, compared with 4,392,480 tons in 1963.

TABLE 7.—France: Salient iron and steel industry statistics

(Thousand metric tons unless otherwise specified)

	1962	1963	1964
Number of blast furnaces:[1]			
Available	141	143	138
In operation	104	97	98
Pig iron production	13,959	14,306	15,863
Raw materials consumption for pig iron production:			
Iron ore directly in blast furnaces	28,295	[r] 21,860	21,246
Iron ore in sintering plants	11,279	17,135	20,780
Total	39,574	[r] 38,995	42,026
Sinter in blast furnaces	10,067	14,335	17,328
Manganese ore:			
In blast furnaces	582	569	630
In sintering plants	37	[r] 38	48
Limestone	487	430	312
Phosphatic limestone	3,613	2,003	1,222
Scrap	883	833	690
Coke in blast furnaces	[r] 12,767	12,091	12,769
Metallurgical rejects	1,199	1,120	1,175
Raw material consumption per ton of pig iron produced:			
Coke kilograms	917	846	806
Sinter do	722	1,003	1,092
Scrap do	65	[r] 59	44
Number of steelworks:[1]			
Thomas converters:			
Available	105	104	101
In operation	102	99	95
Open-hearth furnaces:			
Available	94	94	94
In operation	66	60	60
Electric furnaces:			
Available	[r] 130	[r] 127	131
In operation	[r] 108	[r] 107	108
Crude steel production:			
Ingots	16,870	17,211	NA
Castings	370	346	NA
Total	17,240	17,557	19,780
Raw material consumption of steelworks:			
Pig iron, spiegeleisen, and ferroalloys:			
From Thomas converters	10,996	10,767	11,420
From open hearth	[r] 1,112	1,070	1,220
From electric and other	652	1,242	2,063
Total[2]	[r] 12,761	13,079	14,703
Scrap	6,131	6,204	7,012
Lime	1,727	1,746	1,933
Iron ore	147	151	188
Consumption per ton of crude steel produced:			
Pig iron kilograms	735	739	737
Scrap do	361	[r] 359	359
Total rolled steel production	13,086	13,198	14,619
Total consumption of iron and steel industry:			
Iron ore	39,722	[r] 39,141	42,214
Scrap	[r] 7,015	[r] 7,037	7,701
Coke	13,714	13,522	14,327
Coal other than coking coal	1,570	1,605	1,412
Fuel oil	909	[r] 1,091	1,261
Thomas slag production	2,375	2,351	2,573
Average total employment (workers and staff)	130,854	130,591	130,741

[r] Revised. NA Not available.

[1] At yearend except where otherwise noted.

[2] Includes high carbon ferromanganese and other ferroalloys as follows: 1962—339,000 tons; 1963—327,000 tons; and 1964—358,000 tons.

Source: Bulletin de la Chambre Syndicale de la Sidérurgie Française. (Paris, France). No. 464, 1964, 20 pp. Office Statistique des Communautés Européennes. Sidérurgie. No. 4, 1965. Brussels, Belgium, 1965, 208 pp.

TABLE 8.—France: Pig iron and steel production by district

(Thousand metric tons)

Commodity and district	1960	1961	1962	1963	1964
Pig iron:					
East 1	5,227	5,501	5,490	5,503	5,855
East 2	5,442	5,478	5,118	5,045	5,494
North	2,262	2,329	2,264	2,708	3,388
Southwest	256	278	279	271	254
Southeast	150	187	146	99	117
West	795	793	662	680	754
Total	[1] 14,145	14,566	13,959	14,306	[2] 15,863
Crude steel:					
East 1	5,015	5,236	5,146	5,076	5,511
East 2	6,324	6,314	6,198	6,229	6,968
North	3,970	3,988	3,966	4,392	5,262
Center	831	856	817	779	832
Southwest	117	111	85	73	65
Southeast	307	320	315	324	359
West	717	746	713	683	783
Total	17,281	[2] 17,570	17,240	[2] 17,557	19,780

[1] Includes 13,000 tons produced in Center District.
[2] Detail does not add to total because of rounding.

Source: Bulletin de la Chambre Syndicale de la Sidérurgie Française. Paris, France, No. 464, 1964, 20 pp.

TABLE 9.—France: Iron and steel production by processes

(Thousand metric tons)

	1960	1961	1962	1963	1964
Pig iron:					
Thomas [1]	12,337	12,672	12,169	12,069	13,042
Hematite and semihematite	407	358	270	782	1,300
Phosphorus (foundry)	425	464	448	447	452
Hematite and semihematite (foundry)	332	367	372	444	450
Special pig iron (foundry)	258	289	290	196	205
Spiegeleisen and high carbon ferromanganese	386	407	410	368	412
Total	14,145	[2] 14,566	13,959	14,306	[3] 15,863
rude steel:					
Thomas	10,458	10,404	10,026	9,833	10,604
Open hearth	5,130	5,062	4,926	4,774	5,182
Electric	1,494	1,566	1,526	1,526	1,675
Bessemer	102	112	101	81	93
Kaldo, L-D, and similar	95	423	658	1,341	2,224
Creuset	2	3	3	2	2
Total	17,281	17,570	17,240	17,557	19,780

[1] Includes special pig iron as follows: 1960—56,442; 1961—62,741; 1962—31,006; 1963—6,137: 1964—42,994.
[2] Includes 9,448 tons of special pig iron for steelmaking not given in detail.
[3] Detail does not add to total because of rounding.

TABLE 10.—France: Rolled steel production by type and district

(Thousand metric tons)

	1960	1961	1962	1963	1964
Distribution by type:					
Rails and accessories	445	440	460	337	353
Heavy structural	855	877	897	848	1,030
Wire rods	1,814	1,931	1,753	1,870	2,010
Bars	3,196	3,253	3,210	3,067	3,327
Pipe skelp	650	606	554	529	602
Other	44	27	34	30	37
Flat products:					
Wide plates	66	76	78	81	79
Hot rolled sheets:					
Thickness, 4.76 millimeters or more	939	1,055	928	936	1,199
Thickness, 3 to 4.76 millimeters	366	478	511	516	501
Thickness, less than 3 millimeters	1,165	968	734	641	742
Cold rolled sheets: Thickness, less than 3 millimeters	2,667	2,770	2,929	3,282	3,647
Hot rolled strips for tubes	935	982	998	1,061	1,092
Total flat products	6,138	[1] 6,330	[1] 6,177	[1] 6,518	7,260
Total distribution by type	13,142	[1] 13,465	[1] 13,086	[1] 13,198	14,619
Galvanized and other plated sheets [2]	357	370	360	407	506
Condenser sheets [2]	208	222	196	178	207
Tinplate [2]	604	537	588	591	625
Distribution by district: [3]					
East 1	3,879	4,090	3,967	3,853	3,982
East 2	4,715	4,861	4,739	4,853	5,272
North	3,146	3,072	2,999	3,169	3,952
Center	456	486	467	430	484
Southwest	40	38	32	29	25
Southeast	173	175	165	157	172
West	733	743	716	708	731
Total distribution by district	13,142	13,465	[1] 13,086	[1] 13,198	[1] 14,619

[1] Detail does not add to total because of rounding.
[2] Excluded from total because these forms are produced from items listed above.
[3] Does not include galvanized sheets, condenser sheets, and tinplate, which are produced from other listed items and which therefore are not additive.

Source: Bulletin de la Chambre Syndicale de la Sidérurgie Française. Paris, France, No. 464, 1964, 20 pp.

Investment in the industry continued to decrease from the 1962 level; however, investment in 1962 was at a maximum annual rate achieved to that date.

Two new sintering units started operation during the year, increasing sintering capacity to 19 million tons per year.

Société Anonyme de Lorraine-Escaut, Hauts Fourneaux et Forges de Saulnes-Gorcy, and Société des Laminoirs, Hauts Fourneaux, Forges, Fonderies et Usines de la Providence participated in forming Société SAEM, which will build an ore concentration plant and a sintering belt in the Longwy basin for operation in 1968.

Production capacity for pig iron increased 8.5 percent by operating two new blast furnaces of 8 and 8.5 meter in diameter, respectively. Both are in the eastern district and are designed to use sinter.

Preliminary work was started on a project to build a steel mill at Gandrange. The oxygen steel mill with 1.6 million ton annual capacity will have blooming, continuous billet, and merchant mills and will be built by Sacilor, a company created by Société de Wendel and Union Sidérurgique Lorraine (Sidélor). The merchant mill is to come into operation by 1970. Steel capacity was increased by 4.2 percent, approaching the 22.5 million ton target for the fourth plan; the target for 1970 is 26 million tons. Increase in capacity was achieved by adding a new 55-ton electric furnace and a 50-ton OLP converter (Oxygen Lance Poudré-powdered lime with a stream of oxygen), which replaced a 30-ton Thomas converter, and two LDP converters, which replaced existing Thomas and open-hearth furnaces of a producer in the eastern district.

The industry's medium- and long-term debts stood at $1.6 billion at the end of the year, 68 percent of its turnover. Iron and steel research expenditures in 1964 are estimated at about $16.2 million[10] of which nearly half was spent by Institut de Recherches de la Sidérurgie (IRSID), which is the industry's cooperative research institute. Aside from preparation of geological maps of the Lorraine field, showing distribution of calcareous iron ore by mineralogical types, research was advanced in high-intensity magnetic separation of Lorraine ore as well as magnetic roasting followed by low-intensity magnetic separation. Research in steelmaking was concentrated in the OLP process which is suitable for production of phosphoric pig iron.

TABLE 11.—France: Total investment in the iron and steel industry

(Million dollars)

	1962	1963	1964
Coke ovens and power plants	34	25	11
Raw materials preparation	68	36	19
Blast furnace	36	31	24
Steel furnace	31	24	18
Rolling mills	199	153	105
Miscellaneous	67	57	46
Total	435	326	223

Consumption.—Apparent consumption of steel converted to crude steel totaled 16.8 million tons, compared with 15.2 million tons in 1963; corresponding per capita consumption figures in kilograms were 346 and 318, respectively.[11] Delivery of steel to domestic market increased 11 percent. Shipment to the building industry and steel users, such as manufacturers of steel pipes, wires and cold drawn products, showed the greatest increase. Product-wise, shipment of plates, beams, merchant products, steel for forgings and for making seamless tubes showed a greater increase than other items.

Trade.—Export of French iron and steel attained a record in 1964. These exports were valued at $888 million or 8.3 percent of all French exports. Although the EEC was the largest market for French steel, French imports of steel ingots and rolled steel from the EEC were 1,169,315 tons more than its exports to the EEC. Much of the imbalance results from large French imports from the EEC of primary forms to be rolled into other products. Other large export destinations for French steel were Switzerland, the United States, Spain, the Scandinavian countries, and the United Kingdom. The franc zone may have accounted for about one-half million tons of the exports.

---

[10] Chambre Syndicale de la Sidérugie Française, La Sidérurgie Française en 1964, Paris, France, June 18, 1965, p. 64.

[11] Office Statistique des Communautés Européennes. Sidérurgie. Brussels, Belgium. No. 3, 1965, p. 9. Apparent consumption = production + import − export ± stock variations. In converting to crude steel, the products are multiplied by following factors: Semiproducts and coils 1.18; flat products 1.43; rails and accessories 1.30; other treaty items 1.27; nontreaty items (forgings, drawings, cold drawn wire, steel tubes, and accessories) 1.35.

TABLE 12.—France: Steel and foundry iron delivery to the internal market

(Thousand metric tons)

	1962	1963	1964
Steel:			
Domestic market:			
Merchants and dealers	2,396	2,421	2,979
Steel for conversion into another product [1]	2,240	2,291	2,584
Manufacturing industries	1,539	1,502	1,561
Construction and associated industries	908	883	970
Automobile industry	1,042	1,080	969
Railroads	444	479	552
Other	943	880	964
Total	9,512	9,536	10,579
Of which:			
Tinplate	229	257	262
Special steel	949	925	999
Export market [2]	4,433	[r] 4,455	5,413
Total steel [2]	13,945	[r] 13,991	15,992
Pig iron:			
Domestic market	1,407	1,387	1,415
Of which foundry	1,075	1,026	1,040
Export market	380	[r] 289	295
Total pig iron	1,787	[r] 1,676	1,710

[r] Revised.

[1] For making pipes and tubes, wire drawing, cold rolling, etc.

[2] Total excludes pipes, cold drawn wire, and forgings.

French iron and steel imports in 1964 were valued at $574 million so that net contribution of the industry to trade balance was about $315 million. Approximately 96 percent of all steel imports were from EEC countries. It is estimated that steel imports supplied over one-fifth of the French market, but for some items the share of imports was higher—30 percent for beams and 36 percent for heavy plates.

Traffic in the new Moselle canal during the second semester of 1964 was 850,000 tons, of which 327,000 tons were iron and steel for export. It is too early to say what influence this canal has on French steel trade.

TABLE 13.—France: Summary of iron and steel trade in 1964

Commodity group	To or from all destinations (metric tons)	To or from EEC (metric tons)	Share of total trade with EEC (percent)
Exports:			
Pig iron, spiegeleisen and blast furnace, ferroalloys, powder, shot, etc	375,994	286,792	76.3
Ingots, blooms, billets, slabs and coils for rerolling	841,621	606,877	72.1
Rolled steel [1]	4,774,730	2,119,822	44.4
Iron and steel tubes, pipes and accessories	525,750	72,481	13.8
Unworked steel castings	4,033	2,114	52.4
Imports:			
Pig iron, spiegeleisen and blast furnace, ferroalloys, powder, shot, etc	238,623	160,390	67.2
Ingots, blooms, billets, slabs and coils for rerolling	1,188,000	1,115,000	93.8
Rolled steel [1]	2,886,865	2,781,014	96.3
Iron and steel tubes and accessories	129,026	105,366	81.7
Unworked castings	828	690	83.3

[1] Wire rods, bars, sections, plates, sheets (including coated), hoops, strips, rails and accessories, and wire.

Ferroalloys.—Significant producers and plant locations were as reported in the previous year. Ferrosilicon was the largest item among ferroalloys produced in electric furnaces. Average monthly production in 1964 was reported as follows in tons: ferrosilicon calculated on the basis of 50 percent silicon, 8,613; silicospiegel and ferrosilicomanganese 974; ferrochrome and ferrosilicochrome 5,205; ferromolybdenum (contained metal) 547; and other ferroalloys (contained metal) 2,910.

TABLE 14.—France: Consumption of ferroalloy metals and production of electric furnace ferroalloys by the iron and steel industry

(Metric tons)

Commodity	1961	1962	1963	1964
Consumption of ferroalloy metals:				
Nickel	11,617	9,409	10,756	13,214
Cobalt	421	387	495	450
Chromium metal	165	117	175	153
Chromium in ferrochrome	29,168	25,540	26,560	32,901
Molybdenum	1,645	1,295	1,394	1,487
Tungsten	830	625	545	431
Vanadium	234	222	220	209
Titanium	733	503	592	602
Production of electric furnace ferroalloys:				
Ferrosilicon [1]	130,854	105,293	88,992	[p] 103,400
Ferrochromium	67,397	56,919	54,584	[p] 62,500
Ferromanganese	26,251	28,531	28,957	[p] 26,600
Silico-spiegel and silico-manganese	15,656	[r] 12,476	18,738	11,700
Ferrotitanium	4,736	2,778	3,479	3,978
Silicoaluminum and silico-mangano-aluminum	[r] 1,036	[r] 1,530	953	858
Other	538	393	NA	NA
Total	[r] 246,468	[r] 207,920	NA	NA
Ferromolybdenum [2]	1,985	1,620	1,800	1,815
Ferrotungsten [2]	1,130	883	538	460
Ferrovanadium [2]	449	279	273	310

[p] Preliminary. [r] Revised. NA Not available.

[1] Adjusted to 50 percent silicon. Includes minor ferro-silico-magnesium, ferro-silico-aluminum, and ferro-silico-manganese-aluminum alloys.

[2] Contained ferroalloy metal.

Iron and Steel Scrap—Total consumption by the iron and steel industry, excluding independent steel foundries and rerollers, totaled 7,701,000 tons (7,037,000 in 1963 and 7,075,000 in 1964). Consumption per unit of production of pig iron declined but that for crude steel remained the same. Sources of scrap supply in the last 3 years were as follows:

	1962	1963	1964
Home scrap (steel industry's own):			
Thousand tons	4,041	4,103	4,529
Percent of all scrap	57.6	58.3	58.8
Purchase:			
Thousand tons	2,974	2,934	3,172
Kilograms per ton of steel produced	175	170	163

Lead and Zinc.—Société Minière et Métallurgique de Peñarroya (Peñarroya), the largest producer of lead and zinc concentrates in France, operated mines at La Plagne, Pierrefitte, les Malines, and Peyrebrune. Mining also started at the l'Argentière mine which is expected to become the largest producer of lead and zinc ore in 1965. The company produced 12,872 tons of lead concentrates and 21,437 tons of zinc concentrates in 1964.

Refined lead output increased 15 percent. Peñarroya produced 100,313 tons of lead at Noyelles-Godault. Domestic primary and secondary production (including metal recovered from imported ore) was equal to 70.7 percent of the apparent consumption of 173,700 tons. Deliveries by producers of lead semimanufactures in terms of lead content were 210,500 tons, including 50,900 tons of tubes, pipes, sheets, wire, and similar products; 44,500 tons of cable shielding; 62,200 tons for battery use; 15,400 tons for alloys; and 29,700 tons for chemical usage.

Imports of lead ores and concentrates showed a further increase to 144,090 tons to meet the additional requirements of the Noyelles-Godault smelter. Important suppliers were Morocco (68,947), Australia (28,054), and Canada (13,793). During the year, there was an import duty of $13.19 per ton on crude lead imported from non-EEC countries; imports from EEC countries were subject to duty of 3.2 percent until December when it was reduced to 2.4 percent. Lead prices increased from $219 per ton at the beginning of the year to $344 at yearend.

Of zinc metal output, Peñarroya produced 45,378 tons, the remainder presumably was produced by the other two primary zinc producers, Société des Mines et Fonderies de Zinc de la Vieille Montagne and Compagnie Royale Asturienne des Mines. Domestic smelter zinc production, exclusive of zinc dust, was equivalent to 93.5 percent of zinc consumption estimated at 203,600 tons of metal and 7,000 tons of zinc dust. Delivery of products ready for sale in terms of metal content by semimanufacturers totaled 300,500 tons including 135,600 tons in sheets, strips, tubes, and wire; 64,000 tons in brass; 37,600 castings (including die casting) of brass and other alloys; 76,600 tons for galvanizing; and 46,000 tons for chemical users. Zinc prices increased from $263 per ton on January 1 to $320 at yearend.

In 1964, 368,136 tons of zinc ores and concentrates were imported with principal suppliers as follows in tons: Morocco 72,034; Algeria 57,353; Canada 49,087; Finland 20,058; and Spain 14,935. Imports of zinc and zinc alloys totaled 25,250 tons, of which about 22,000 tons was unwrought. Corresponding exports were 11,920 tons and 1,709 tons. Duty on zinc imported from countries other than EEC was $16.40 per ton and for zinc imported from EEC it was 4.8 percent from November 1963 until December 1964 when it was reduced to 3.6 percent.

Tin.—Primary tin consumption (of which none was produced in France) totaled 11,200 tons as follows by use in percent: tin plating 56; solders 21; bronzes 9; antifriction metals 6; salts 5; and miscellaneous 3. About 300 tons of secondary tin recovered in France was used principally by the chemical industry and in producing alloys. Imports totaled 11,314 tons of tin during 1964 with Malaya, the Netherlands, Belgium, and the United Kingdom as principal sources in the order given. Tin prices rose from $1.35 per pound on January 1 to $1.61 per pound at yearend.

Uranium and other radioactive minerals.[12]—The Commissariat à l'Energie Atomique (CEA) continued with its policy of producing or purchasing 1,500 tons of uranium annually, the purchase price being equivalent to about $8 per pound of U_3O_8.

Prospecting and exploration for uranium ore was carried out by CEA in the Châtelguyon region, in areas south and west of Clermont-Ferrant and in the Hérault. Exploration was also carried out in the three mining divisions of La Crouzille, Forez, and Vendée. Private industry was active in exploration as follows: Société Centrale de l'Uranium et des Minerais Radioactifs in the Permian formations of Brousse (Aveyron); Compagnie Française des Minerais d'Uranium in Lozère; Société Industrielle et Minière de l'Uranium in Moribhan. The Compagnie Miniére et Métallurgique de l'Indochine prospected the Lussac area in Haute-Vienne Département.

As a result of this exploration there were changes in the uranium reserves of France as follows:[13]

Mines and deposits of CEA	Reserves (Tons of contained uranium)	
	1963	1964
Forez-Morvan	5,470	5,190
La Crouzille	5,520	6,430
Vendée	3,670	3,870
Vosges	2,030	2,030
Hérault	4,310	5,880
Total	21,000	23,400
Private companies in Brittany	1,110	1,130
Private companies in Massif Central	5,580	5,230
Grand total	27,690	29,760

Four mills treated 726,000 tons of ore and 1,310 tons of preconcentrates from Gabon.[14] The two mills of Société Industrielle des Minerais de l'Ouest (SIMO), Bessines and L'Ecarpière, treated 576,000 tons. Of the CEA plants, Bois-Noirs[15] treated 150,000 tons of ore and Guegnon 1,310 tons of Gabon preconcentrate.

French uranium production in terms of contained metal was 1,410 tons—740 tons of uranate with metal content of 60 percent or more and 670 tons of uranyl nitrate with 400 grams of uranium per liter. An additional 130 tons was obtained from high-grade uranothorianite concentrate obtained from the island of Madagascar. The latter was also the source for 310 tons of contained thorium.[16]

All the uranium needed for the projects of the CEA, the atomic powerplants of Électricité de France and for the production of uranium tetrafluoride for the Pierrelatte plant were produced at Le Bouchet and Malvési, the latter plant producing three-quarters of the total. The fluoridation furnaces are located in Malvési. Le Bouchet started using the magnesium-thermal reduction process of producing uranium (replacing calcium-thermal reduction method) and two-thirds of its metal output was obtained by using the new method.

---

[12] Commissariat à l'Énergie Atomique Rapport Annuel 1964. Paris, France, 1965, 191 pp.

[13] Page 24 of work cited in footnote 12.

[14] Pages 28 and 29 of work cited in footnote 12.

[15] Under the management of SIMO.

[16] Page 21 of work cited in footnote 12.

With the progressive operation of the Pierrelatte gas-diffusion plant, France started producing enriched uranium; toward the end of the year isotopic nominal grade of 2 percent U–235 was attained. An installation for producing heavy water was under construction at Mazingarbe where a coal chemical complex is being built.

During the year the CEA operated eight mines and produced a total of 720,000 tons of ore with an average of 0.116 percent of uranium as follows: 275,000 tons in the La Crouzille division; 150,000 tons in the Forez division; and 295,000 tons in the Vendée division. Private companies delivered 53,000 tons of ore to the CEA containing 172 tons of uranium (0.325 percent U).

NONMETALS

In 1964, production of crude potash and potassium chloride as well as domestic and foreign shipments increased. Increases were also shown in salt production, building raw materials, and pyrite.

The value of nonmetals produced in 1963, exclusive of building raw materials and quarry products, totaled about $137 million. Potash, salt, and sulfur were the most important, accounting for 62, 18, and 15 percent, respectively of the total value. Building raw material and quarry products were valued at $398 million, of which about $45 million was accounted for by material used in industry,[17] about $3 million by material used in agriculture and $350 million by material used in the building industry. The latter figures comprised sand and gravel ($134 million), other building materials such as stone, clays, cement, limestone, and gypsum ($115 million), and material for road building and similar uses ($101 million).

Value of nonmetal imports and exports including cement and lime in 1964 totaled $142 million and $119 million, respectively.[18] Trade in slag, scalings, dross, and ash including Thomas slag added about $9 million to imports and $12 million to exports. Among imports, phosphate rock ($37 million), clay and other refractory materials ($16.9 million), sand and gravel ($16.3 million), asbestos, $16.1 million), Thomas slag ($7.6 million), sulfur ($5.4 million), and pyrite ($4.2 million) were the most important. Potash, in chemically treated form, cement, and sulfur exports were valued at $45.0 million, $22 million, and $22 million, respectively.

Cement and Lime.—Cement production increased at a rate of about 1.4 times that of growth of industrial production. France maintained its rank as the sixth largest world cement producer.

Cement production capacity increased by 4.6 million tons (23 percent), to 24.6 million tons at yearend. Technical improvement and installation of secondary equipment to improve operations accounted for 3.4 million tons of additional capacity. Five rotary kilns using the dry process were added to existing plants, two of these replacing old kilns. At the beginning of 1964 there were 62 plants in operation, of which 15 had each an annual capacity of more than 500,000 tons,

---

[17] Including mine fill.
[18] Includes value of crude fertilizers and chemically treated potash.

20 had capacities between 300,000 and 500,000 tons, 23 had capacities of 100,000 to 300,000 tons, and 4 had capacities of less than 100,000 tons.

In spite of increased output, employment increased only by 50, to 13,800 in 1964 (10,300 laborers and 3,500 administrative, technical, and clerical staff). Output per person employed in the industry increased from 1,302 to 1,544 tons per year. Corresponding average figures for all EEC countries were 1,255 and 1,395 tons.

Data on production of cement by types in 1964 were not available; in 1963, 70 percent of the total was Portland cement, and metallurgical cement constituted 22 percent of the output.

TABLE 15.—France: Cement production, by types

(Thousand metric tons)

	1959	1960	1961	1962	1963
Portland	8,990	9,281	9,607	11,757	12,647
Slag (blast furnace)	2,566	2,381	2,837	2,203	2,485
Special	1,166	1,130	1,860	1,475	749
Other slag	738	865	404	626	1,448
Total	13,460	13,657	14,708	16,061	17,329
Natural	175	121	177	397	275
Mortar	364	381	496	424	530
Total	13,999	14,159	15,381	16,882	[r] 18,134

[r] Revised.

Apparent consumption in 1964 was 20.6 million tons or 425 kilograms per capita. Of total shipments, 59.7 percent was shipped in bags and the remainder in bulk. The industry invested $34 million in 1964. The investment program for 1965 and 1966 envisaged 4 new plants, adding 1,200,000 tons to capacity and adding 11 kilns in existing plants (9 dry, 1 wet and 1 vertical) which would add another 2,250,000 tons to capacity.

France's cement exports (including clinker) decreased 22.6 percent, to 836,077 tons in 1964. This was chiefly because of reduced exports to non-EEC countries, exports to EEC being 383,692 tons in 1963 and 321,314 tons in 1964. Cement imports were not significant—20,800 tons of cement and 65,800 tons of clinker in 1964.

There were 76 lime producing plants at the beginning of the year. Some 40 of these were combined with cement plants and the remainder were lime burners which do not make any cement. Of the 76 plants, annual capacities for 9 exceeded 50,000 tons; for 23 were 30,000 to 50,000 tons; for 29 were 10,000 to 30,000 tons; and for 15 were less than 10,000 tons.

Location and distribution of plants producing high-purity or fat lime (chaux grasse) in 1963 remained about the same as in 1962. In 1963, 2.6 million tons of this grade of lime was produced as follows: For use in iron and steel plants 1.8 million tons; for use in calcium carbide and other chemicals 0.6 million tons; for agricultural use, including vine culture 0.2 million tons.

Construction Material and Quarry Products.—Preliminary data indicate increases in the monthly average production of building stone and raw material used in the manufacture of cement, lime, brick, plaster, tile, and ceramic and refractory materials, as shown by the following:

Commodity	Quantity (thousand tons)		Change, 1964–65 (percent)
	1963	1964	
Calcareous building stone	109.9	130.3	+18.6
Furnace limestone	278.3	289.0	+3.8
Slate	8.87	10.21	+15.1
Plaster	168.3	207.0	+23.1
Alluvial sand and gravel	6,654	7,964	+19.7
Industrial sand	238	248	+4.2
Road building material	3,762	4,268	+13.5
Pozzalana	42.3	48.3	+14.2
Cement	1,491.4	1,775.9	+19.1
Shipments	1,494.5	1,779.8	+19.1
Exported	89.8	69.6	−22.5
Hydraulic lime	98.5	111.6	+13.3
Hydraulic shipment	99.3	111.6	+12.4

In 1963, output comprised about 46 million tons of construction materials; 87 million tons of sand and gravel; 50 million tons of road and foundation building material; 26 million tons of material for industry such as kaolin and refractory clays, limestone, glass and foundry sands, limestone for the cement and steel industry, chalk, barite and others; and 1,107,000 tons for materials for soil improvement and other agricultural uses, including limestone, gypsum, marl, phosphate, and phosphatic lime.

In 1963 the industry employed 93,900 persons of which 78,400 received hourly wages and the remainder salaries. This figure does not include workers in limestone and clay quarters, which were captive operations of the cement plants. The turnover of the industry in 1963 was about $650 million.

TABLE 16.—France: Size of quarry and sand and gravel operation in 1963

(Number of employees)

	0 to 10	11 to 20	21 to 50	51 to 100	101 to 200	201 to 500
Sand and gravel	1,236	201	97	18	7	2
Industrial sand	95	10	12	3	1	------
Road building materials	816	230	102	25	9	------

Source: Institut National de la Statistique et des Études Économiques. Annuaire Statistique de la France 1964. Paris, France, 1965, pp. 234–235.

Fluorspar.—In 1963 production of fluorspar consisted of 76,163 tons of cleaned and cobbed ore with 60,332 tons of CaF_2 and 137,566 tons of ore for concentration. During the year 124,662 tons of ore was concentrated to give 69,265 tons of concentrate with 67,064 tons of CaF_2 (96.8 percent). Production was reported in 17 Départements with Pyrénées-Orientales, Var, Puy-de-Dome, and Haute Loire as the principal ones.

The French steel industry used 37,055 tons of fluorspar. Consumption by other industrial sections is not available. Fluorspar exports in 1964 totaled 56,820 tons with West Germany as the main recipient (32,101 tons), followed by Sweden (6,205 tons), Belgium-Luxembourg (5,311 tons), and the Netherlands (3,205 tons).

TABLE 17.—France: Salient statistics of the potash industry

(Thousand metric tons unless otherwise specified)

	1960	1961	1962	1963
Production:				
Mine run ore	9,919	10,860	11,024	11,058
K_2O equivalent	r 1,733	r 1,904	r 1,922	r 1,914
Marketable ore, K_2O equivalent [1]	1,532	1,710	1,722	NA
Average daily output of mine run ore ... tons	35,057	----------	40,329	41,807
Bromine production ... do	1,997	NA	NA	1,903
Average grade [1] ... percent K_2O	17.47	17.53	17.44	17.32
Average output of mine run ore per underground man-shift ... kilograms	7,227	7,952	8,189	8,395
Production by mining methods:				
Room and pillar ... percent	57.0	60.4	60.8	55.7
Longwall ... do	43.0	39.6	39.2	44.3
Ore treated ... do	9,653	NA	10,691	10,812
K_2O content	1,683	NA	1,854	1,862
KCl produced (50 percent K_2O equivalent basis)	2,968	3,317	3,311	3,342
K_2O equivalent	1,484	1,658	1,656	1,671
Recovery of treatment ... percent	88.2	89.6	89.3	89.7
Sales of potash, K_2O:				
France [2]	810	888	995	r 983
Foreign	727	808	668	r 744
Total sales	1,537	1,696	1,663	r 1,727
Number of workers at end of year ... persons	10,730	NA	10,503	10,369

NA Not available. r Revised.

[1] Marketable ore is the total sale of potassium chloride and carbonate and crude salt as is.

[2] Includes franc area. Exports to these areas in 1961 and 1962 were 43,725 and 31,089 tons respectively.

Potash.—In 1964 France produced about 16 percent of world potash, ranking behind the United States, the Federal Republic of Germany, and East Germany. In 1963 production by longwall method showed increases at the expense of room and pillar. Of the potassium chloride (KCl) produced in this year, 1,102,295 tons of K_2O equivalent was recovered from hot leach, 512,941 from flotation, and 55,600 from levigation. Shipments to the internal market in 1964 in terms of K_2O were 1,038,000 [19] tons and exports 810,000.[20] Exports in 1964 included 91,482 tons of crude potash (mainly to the EEC) and 1,403,000 tons of chemical potassic fertilizers, mainly potassium chloride. Among destinations were the following: Belgium-Luxembourg 259,701 tons; the United Kingdom 190,787 tons; the United States 167,765 tons; Japan 85,287 tons; the Netherlands 80,540 tons; and Switzerland 77,189 tons.

Salt.—Breakdown of salt by sources of production for 1964 was not available; of the total produced in 1963, 2,327,857 tons was obtained from brine of salt springs in Lorraine and 604,718 from salt marshes. The remainder was rock salt including the refined type.[21] There was a substantial decrease in marine salt output from the 1962 level of 1,267,282 tons, probably because of climatic conditions.

The major share of the brine salt was used in solution for making sodium carbonate. Marine salt shipments, by user, were as follows: Industry and agriculture 759,937 tons; domestic consumption 177,376 tons; fisheries 22,044 tons; and exports 37,521 tons. Of the remaining 761,205 tons of rock salt including refined, 219,590 tons reportedly was shipped to agriculture, 186,436 tons to domestic consumers, 75,600 tons to the chemical industry, and 87,638 tons to export.[22]

---

[19] Provisional.

[20] Ministère de l'Industrie. Bulletin Mensuel de Statistique Industrielle. Paris, France, July 1965, p. 4. Provisional data.

[21] Bureau de Documentation Miniére. Statistique de l'Industrie Minerale 1963. Annales des Mines. Paris, France, 1965, p. 61.

Sulfur and Pyrites.—Production of sulfur by Société Nationale de Pétrole d'Aquitaine (SNPA) increased to 1,510,700 tons, 102,000 more than in the previous year when production was adversely affected by a strike of gasworkers. Other producers were Compagnie de Raffinage Shell-Berre (7,000 tons) and Nobel-Bozel S.A. (3,000 tons). SNPA started delivering liquid sulfur from Lacq and the port of Bayonne during the year. Closing of the Chizeuil mine and reduced output at Saint Bel caused a drop in pyrite production.[23]

Production of sulfuric acid in 1964 increased to 2.7 million [24] tons of 100 percent H_2SO_4 including 1.9 million tons contact, 685,000 tons chamber, and 72,000 tons acid sludge. The increased acid production was used mainly to meet the higher requirements of the fertilizer industry.

Produits Chimiques Péchiney–St. Gobain was adding a 150-ton-per-day contact sulfuric acid plant to its Grand Quevilly fertilizer and chemical works in Seine Maritime Départment.[25] During 1963 and 1964 this company installed sulfuric acid plants at Bordeaux, Saint-Fons, and Salendires with a total daily production capacity of 790,000 tons.[26] A 100,000-ton-per-year sulfuric acid plant will also be included as part of a new major fertilizer plant to be built at Boucau, near Bayonne.[27]

Export of sulfur in 1964 totaled 1,038,000 tons. More than 88 percent was delivered to West Europe, with the United Kingdom as the largest market (378,614 tons), followed by West Germany (126,695 tons), the Netherlands (93,855 tons), and Sweden (64,201 tons). Sulfur imports were 214,758 tons with 173,375 tons from Mexico and 40,925 tons from the United States.

Pyrite imports (unroasted) stood at 368,984 tons—178,179 tons from Spain, 95,466 tons from Cyprus, and 39,187 tons from Portugal among others.

MINERAL FUELS

The pattern of energy consumption in 1964 showed the trend of the past years—a decline in the relative share of solid fuels concomitant with an increase in that of petroleum products. The increase in petroleum product consumption was about 60 percent more than the increase in total energy consumed. The contribution of hydropower to total energy declined because of lower output of this type of energy. Gas improved its position as an energy source.

Coal.—*Production.*—Because of peaceful labor conditions in the industry, coal production recovered in 1964 and exceeded not only the 1963 level but also that of 1962 which was a more normal year. An important factor favoring production in 1964 was the decline in hydroelectric power resulting from low water levels compensated by a 31.7 percent increase in thermal power output. For the mines of Charbonnage de France, production target was set at 54,016,000 tons of coal and lignite and was exceeded by just over 1 percent. Nonnationalized coal mines produced 115,000 tons. The 1970 target is 48 million tons plus or minus 1.5 million tons. The reduction in output is foreseen mainly for Nord/Pas-de-Calais mines. Mines of Nord/Pas-de-Calais produced 50.0 percent of the total output, those of Lorraine 29.5 percent, and the remainder was accounted for by mines of Centre-Midi (Blanzy, Loire, Cévennes, Aquitaine, Auvergne, Dauphiné, and others). Output of mines of Lorraine (15 million tons) was 1.3 million tons more than in 1962, attaining a record; however, output of Nord/Pas-de-Calais mines (26.6 million tons) decreased 577,000 tons short of their 1963 output as a result of inadequate labor supply. Performance by Centre-Midi mines varied, with Loire and Dauphiné producing less than targets and Aquitaine and Cévennes exceeding targets.

---

[22] Total of export figures given in work cited in footnote 21, 125,159 tons is slightly larger than official trade figures given in table 3.

[23] Sulphur (London). February 1965, p. 23.

[24] Provisional.

[25] Sulphur (London). June 1964, p. 8.

[26] Sulphur (London). April 1965, p. 9.

[27] Page 8 of work cited in footnote 26.

TABLE 18.—France: Energy consumption by sources

Type of fuel	1960	1961	1962	1963	1964 [p]
Quantity:					
Solid fuel..........million tons of standard coal equivalent..	69.5	70.7	74.8	74.9	73.9
Petroleum products..........do....	38.7	42.0	48.8	57.3	66.3
Gas..........do....	4.4	6.0	7.3	7.8	8.1
Hydroelectric power..........do....	16.2	[r] 15.4	14.2	17.8	15.0
Total..........do....	128.8	[r] 134.1	145.1	157.8	163.3
Share of total:					
Solid fuel..........percent..	54.0	52.7	51.6	47.5	45.2
Petroleum products..........do....	30.0	31.3	33.6	36.3	40.6
Gas..........do....	3.4	4.5	5.0	4.9	5.0
Hydroelectric power..........do....	12.6	11.5	9.8	11.3	9.2
Total..........do....	100.0	100.0	100.0	100.0	100.0

[p] Preliminary. [r] Revised.

Source: Comité Professionnel du Pétrole. Elements Statistiques, Activité de l'Industrie Pétrolière 1963. V. 1. Paris, France, 1964, p. A. 10.

Mechanized mines (those in which breaking and loading are mechanized[28]) produced 59.9 percent of net coal mined underground in October 1964, while semimechanized mines (those in which either breaking or loading is mechanized) contributed 24.4 percent.

In the mines of Charbonnage de France during 1964, some of the following equipment was used in coal exploitation: 19,000 pneumatic drills 13,300 drills for rock and coal, 193 longwall coal cutters, 155 cutter loaders, and 186 ploughs. Loaders (for both coal and rock) comprised 730 mechanical shovels, 680 chain conveyors, and 157 duck bill loaders. Use of single and double drum coal cutters has increased, the latter especially in the thick seams of Lorraine. As a result of lengthening working face and increasing mechanization, production per working face per day increased to 215 tons in October 1964, compared with 200 tons in October 1963. Productivity increases for underground workers[29] was highest in Lorraine. This basin has the highest underground productivity of all coal mines of the EEC. The productivity increase in Nord/Pas-de-Calais was more modest. Increased mechanization of longwalls in Nord/Pas-de-Calais and use of double drum coal cutters and self-advancing props in Lorraine mines were factors in improving productivity.

---

[28] Winning of coal by pneumatic or electric pick methods is not considered a mechanized operation.

[29] Ratio of production to the number of underground shifts.

TABLE 19.—France: Salient statistics of the coal and lignite industry

	1960	1961	1962	1963	1964
Coal:					
Production..........thousand tons..	55,966	52,363	52,369	47,762	53,030
Apparent consumption thousand tons of standard coal equivalent..	[1] 69,646	70,665	72,900	77,100	74,400
Stocks at yearend..........do....	13,328	11,974	8,692	6,123	5,703
Number of operating mines..........	95	86	83	NA	NA
Average number of days worked..........	287	378	280	256	278
Average daily output..........	195,200	188,500	197,045	186,500	190,400
Number of men working daily at yearend:					
Underground..........	130,052	120,480	117,394	115,090	110,900
Surface..........	55,218	51,720	49,125	46,795	44,951
In associated plants..........	9,952	10,079	10,108	9,894	9,307
Production per man-shift:					
Underground man-shifts only..........kilograms..	1,795	1,878	1,922	1,958	2,046
All man-shifts..........do....	1,215	1,262	1,305	1,332	1,411
Power production by pithead steam plants:					
Quantity..........million kilowatt-hours..	8,847	10,428	12,152	10,931	14,762
Share of thermal power produced in France; percent..........	27.8	27.2	25.7	24.4	25.0
Share of total power produced in France; percent..	12.3	13.6	14.6	12.4	15.7
Lignite:					
Production..........thousand metric tons..	2,276	2,906	2,882	2,475	2,241
Stocks at yearend..........do....	502	489	500	485	456
Average number of days worked..........	251	252	244	256	259
Average daily output..........metric tons..	9,100	11,500	11,800	9,700	8,600
Number of men working daily at yearend:					
Underground..........	2,303	2,148	1,982	1,853	1,780
Surface..........	1,398	1,202	1,118	1,066	1,030
Associated plants..........	140	149	136	146	111
Production per man-shift:					
Underground man-shifts only..........kilograms..	2,791	3,090	3,700	3,890	4,103
Total man-shifts..........do....	2,668	3,824	4,120	3,579	3,334

r Revised. NA Not available.

[1] Includes lignite.

TABLE 20.—Coal production classified by rank

(Thousand metric tons)

Quality	Volatile matter (percent)	Quantity		
		1962	1963	1964
Anthracite..........	5 to 10	3,163	3,053	3,373
Semianthracite..........	7 to 14	8,648	7,869	8,913
Bituminous:				
Low volatile [1]..........	14 to 18	5,670	5,249	5,247
Medium..........	16 to 28	14,041	12,392	13,317
High volatile..........	25 to 41	18,072	16,686	19,117
Do..........	[2] 40 to 42	2,765	2,504	3,064
Total..........	....	[3] 52,359	[3] 47,754	[3] 53,030

[1] The bulk of the production in this class contains 14 to 18 percent volatile matter; small tonnages have a higher volatile content.

[2] Applies to the bulk of production in this category.

[3] Data differs slightly from that given elsewhere in this chapter because of differences in source.

Source: Office Statistique des Communautés Européennes. Statistiques de l'Energie. No. 3, Brussels, Belgium, 1965, pp. 43-46.

TABLE 21.—Status of mechanization of coal working faces, October 1964

	Average number of operating faces	Average daily production all faces (metric tons)	Average daily production per face (metric tons)	Average length (meters)	Average face advances (centimeters)
Mechanized faces:					
Longwall with long faces	252	77,459	318	139	144
Longwall with long faces and multiple attack	136	27,334	200	223	29
Small operations (room and pillar and cut and fill methods)	112	11,566	102	33	151
Total and/or average	490	116,359	237	138	93
Semimechanized:					
Longwall with long faces	221	41,874	190	90	115
Small operations (room and pillar, etc.)	42	5,819	141	42	149
Total and/or average	263	47,693	183	82	118
Other	82	15,159	186	96	106
Total and/or average	835	179,211	215	116	100

Source: Charbonnage de France, Bulletin d'Information, Techniques, January–February 1965, No. 120, Paris, France, 19 pp.

TABLE 22.—France: Average output per man-shift in principal coal basins (bituminous and anthracite)

(Kilograms)

	1960	1961	1962	1963	1964
Nord/Pas-de-Calais:					
Underground	1,562	1,610	1,633	1,663	1,709
Underground and surface	1,068	1,099	1,129	1,149	1,191
Lorraine:					
Underground	2,580	2,704	2,808	2,903	3,113
Underground and surface	1,704	1,760	1,839	1,902	2,078
Centre-Midi:					
Underground	1,855	1,997	2,099	NA	NA
Underground and surface	1,230	1,317	1,392	NA	NA
Blanzy:					
Underground	2,027	2,112	2,202	2,182	2,214
Underground and surface	1,361	1,422	1,487	1,455	1,475
Loire:					
Underground	1,757	1,818	1,789	1,717	1,760
Underground and surface	1,197	1,231	1,208	1,165	1,215
Cevennes:[1]					
Underground	1,643	1,683	1,743	1,663	1,666
Underground and surface	1,059	1,064	1,119	1,145	1,284
Aquitaine:					
Underground	1,840	2,077	2,172	2,338	2,536
Underground and surface	1,240	1,381	1,445	1,536	1,635
France:					
Underground	1,795	1,878	1,922	1,958	2,046
Underground and surface	1,215	1,262	1,305	1,332	1,411

NA Not available.

[1] Include small tonnages of coal produced in open-cast mines.

Coal production cost in 1964 was $16.95 per ton, compared with $18.05 per ton in 1963. The 1964 cost was composed of labor $11.20; supply $3.25; overhead, taxes, and financial charges $1.00; and amortization $1.50. This was $1.15 less than the price received for the coal. Gross loss before amortization was $5.27 million and with amortization $127.8 million ($180.6 million in 1963). The loss consisted of $150 million on exploitation activities and a profit of $22 million in conversion of coal into electricity, coke, chemicals, and other products. Final deficit taking into account profit and loss and governments' participation in the rationalization of the coal mines was $38.2 million ($57 million in 1963).[30]

Consumption and Trade.—Apparent consumption of coal and lignite in 1964 was 74.4 million tons of standard coal equivalent—71.6 million tons of coal and 2.8 million tons of lignite. Share of domestic coal and lignite in apparent consumption was 73.7 percent. Total sales of solid fuels from all sources was 60.5 million tons (65.6 million tons in 1963). The loss in sales was borne essentially by imported coal. Sale to the principal coal consumers were as follows in thousand tons: Iron and steel industry 17.489; domestic users and small industry 16,293; industry 12,372; and Electricité de France 7,652. Sale to Gas de France was 1.3 million tons and to briqueting plants 1.7 million tons.

Sale of domestic coal to Electricité de France and the iron and steel industry increased but sale to domestic and industrial users declined, some of these preferring imported coal. Of the coal which was produced and imported in 1964, 41 million tons was transformed as follows into electricity, coke, and briquets: Electricity 16.3 million tons, coke 18.3 million tons, briquets 6.4 million tons, and gas 70,000 tons.

Electricity production used 30 percent more coal and lignite than in 1963 but at the same time fuel oil consumption more than doubled. Thermal electricity output increased 31.7 percent from 44,858 million kilowatt hours in 1963 to 59,100 million kilowatt hours in 1964. Total output were 88,245 and 93,800 million kilowatt-hours, respectively.

Despite an increase of 10.8 percent in pig iron and 12.7 percent in steel production, total blast furnace coke consumption increased only by 5.6 percent because coke consumption decreased from 846 to 806 kilograms per ton of pig iron produced.

The share of total fuel needs of industry (other than iron and steel industry and small industry) supplied by solid fuels decreased further to 39.7 percent (45.2 percent in 1963 and 49.7 percent in 1962), whereas that supplied by fuel oil increased from 40.4 percent in 1962 to 45.6 percent in 1963 and 50.3 percent in 1964. Natural gas supplied 10 percent of the needs in 1964, compared with 2.7 percent in 1962. Total delivery to industry increased from 27.2 million tons of standard coal equivalent to 32 million tons.

Gas de France used 1,375,000 tons[31] of coal for gas production (1.9 million tons in 1963 and 3.3 million tons in 1960). Producer gas constituted only 31.5 percent of the gas supply. At the end of 1964 only a few plants were left producing gas from coal distillation.

Coal prices remained the same as in June 1962 as reported in the 1963 edition of this volume of the Minerals Yearbook.

Imports from all principal sources decreased except for those from Belgium and Poland. While shipments of U.S. coal destined to Electricité de France and coastal briqueting plants decreased, orders for U.S. coking coal nearly doubled from 510,000 to 1,031,000 tons in 1964. An agreement concluded between France and the U.S.S.R. fixed the quantity of coal to be imported per year from the U.S.S.R.

---

[30] Charbonnage de France. Rapport de Gestion 1964. Paris, France, 1965, p. 101.
[31] Provisional.

during 1965–69. The lower limit was set at 1.3 million tons and the upper limit at 1.7 million tons, increasing to 2 million tons.

Exports of coal in 1963 were the lowest since 1949 and compared with 1963, 1964 coal export was still 2.8 percent lower.

TABLE 23.—France: Coal availability and distribution

(Thousand metric tons)

	1960	1961	1962	1963	1964
Net production [1]	55, 960	52, 358	52, 359	47, 754	53, 030
Middlings, foreign coal, etc	62	64	113	561	921
Stock variations [2]	+2, 241	−1, 195	−3, 060	−2, 408	−422
Total availability	53, 781	53, 617	55, 532	50, 723	54, 373
Consumption by mines and mine powerplants	7, 119	7, 767	8, 791	7, 954	10, 209
Delivery to miners	1, 342	1, 254	1, 234	1, 201	1, 079
Delivery for transformation:					
Mine coke ovens	9, 538	9, 483	9, 584	8, 862	10, 091
Steel plant coke ovens	2, 400	2, 434	2, 467	2, 121	2, 119
Gas coke ovens	1, 575	1, 333	1, 099	661	539
Briqueting plants	4, 848	4, 838	5, 241	4, 983	4, 723
Total	26, 822	27, 109	28, 416	25, 782	28, 760
Exports [1]	1, 444	1, 361	1, 337	953	899
Total available from domestic production	25, 515	25, 147	25, 779	23, 988	24, 714
Imports [1]	10, 114	10, 334	10, 807	15, 584	13, 447
Delivery from imports:					
Coal mine coke ovens	524	460	706	1, 368	1, 283
Steel plant coke ovens	3, 275	3, 372	3, 230	3, 587	3, 551
Gas coke ovens	825	607	554	1, 103	730
Briqueting plants	813	945	1, 312	2, 724	1, 723
Mines, for use, blending, or stocks	----------	21	4	378	(3)
Stock variations [2]	+867	+1, 003	+497	−2, 799	+291
Available from imports	3, 810	3, 926	4, 504	9, 223	5, 869
Available for domestic distribution	29, 325	29, 073	30, 283	33, 211	30, 583
Railroads	2, 681	2, 517	2, 306	2, 263	2, 081
Gasworks	885	543	321	181	69
Electricity	4, 728	5, 049	5, 978	7, 659	7, 064
Iron and steel	1, 412	1, 387	1, 624	1, 649	1, 557
Other industries	11, 147	10, 908	10, 762	10, 861	9, 823
Domestic and small industries	8, 472	8, 669	9, 292	10, 598	9, 989

[1] Data presented differ slightly from those given elsewhere in chapter because of differences in sources.
[2] Plus (+) denotes addition to stocks; minus (−) denotes withdrawal from stocks.
[3] Accounted for in figure on available for domestic consumption.

Source: Bureau de Documentation Minière. Combustibles Minéraux Solides. Statistique Annuelle Définitive. Pt. 2, for the years 1960–64, Paris, France.

TABLE 24.—France: Imports of coal, coke, and coal and lignite briquets in 1964

(Thousand metric tons)

Origin	Coal	Coke	Coal briquets	Lignite briquets	Total
EEC Countries:					
West Germany	5, 707	3, 727	109	535	10, 078
Saar	2, 636	925	----------	----------	3, 561
Netherlands	959	1, 037	256	12	2, 264
Belgium	937	184	356	----------	1, 477
Total EEC countries	7, 603	[1] 4, 954	721	547	[1] 13, 825
Other countries:					
United Kingdom	1, 064	4	20	----------	1, 088
Poland	542	----------	----------	----------	542
U.S.S.R	1, 722	----------	----------	----------	1, 722
United States	2, 015	----------	----------	----------	2, 015
Other countries	501	----------	----------	20	521
Grand total	13, 447	4, 958	741	567	19, 713

[1] Includes 6,000 tons of coke from Italy.

Source: Bureau de Documentation Minière. Combustibles Minéraux Solides. Statistique Annuelle Définitive. Pt. 2, 1964, Paris, France, 6 pp.

Preparation.[32]—Washing capacity in 1964 was about 24,000 to 25,000 tons of coal per hour, of which 21,000 tons were in plants built new or modernized since 1946. In 1964, 88 percent of mine run coal was washed (86.6 percent in 1963). Of the coal washed, 48 percent was treated in heavy-media units, 42.1 percent in piston jigs, 7.5 percent in flotation cells, 1.9 percent on pneumatic tables, and 0.5 percent by miscellaneous methods. Practically all of the washed coal of 5 to 10 millimeter size (0.2 to 0.4 inch) is obtained from heavy-media cells. The percentage obtained by this method of coal preparation has almost doubled since 1956 (24.7 percent) at the expense of jigs (55.4 percent), pneumatic cleaning (6.1 percent), and rheolaveurs which are no longer in use. For finer coal, heavy-media cyclones have proved very useful; one unit came into production during the year at Messeix in Auvergne and two fine coal washing plants in Nord/Pas-de-Calais will be equipped with heavy-media cyclones. Use of flotation for extra fines followed by filtration and drying has maintained its position. This method produces slimes from low-grade coals which are being used for making briquettes and recovering coking coal. The Bruay washery for fines was completed in Nord/Pas-de-Calais and work was started on a coal washing plant at Barrois to treat similar coal. In Lorraine, a flotation-drying installation was put into operation at Simon and a new washery will be put into operation at Wendel I–II.

Manpower.—Although employment in the industry, both surface and underground, decreased again in 1964, manpower shortage was only serious in the Nord/Pas-de-Calais basin where some improvement was reported at the end of the year. Employment on December 31, 1964, in the mines of Charbonnage de France (including lignite) totaled 158,109; 93,778 in the Nord/Pas-de-Calais basin, 34,053 in the Centre-Midi, and 30,278 in Lorraine. For the above basins a programed reduction of 3,164 was exceeded, the actual decrease in employment being 4,492.

Average salary for an 8-hour, 15-minute day, including all premium[33] but excluding payments for vacation and rest days were as follows:

Year	Average daily salary (Dollars)		
	Underground	Surface	Surface and underground
1962	6.56	5.08	6.09
1963	7.31	5.70	6.80
1964	8.03	6.29	7.48

Fringe benefits and social security payments were equivalent to 83.29 percent of wages. Because of four successive wage increases on January 1, April 1, July 1, and October 1 for the year as a whole, personnel costs increased by about $22 million.

---

[32] Figures provisional.
[33] An annual premium on productivity starting with 1,075 kilograms per surface and underground worker and a semestrial premium adjusted by rate of absenteeism in all basins.

Patent Fuels.—The exceptionally high level of patent fuel production in 1963, which resulted from the severe winter, was not maintained in 1964; the decrease was 1.37 million tons. Of the 1964 output 5.16 million tons was classified as boulet (egg-shaped agglomerates used for domestic heating), 1.2 million tons was special (smokeless) agglomerates, and 256,000 tons was briquets. Coal mines of Charbonnage de France produced 5 million tons and private mines and patent fuel producers other than mines provided 1.6 million tons. While output of boulets decreased in 1964 by 1.52 million tons compared with 1963, smokeless agglomerates production increased by 179,000 tons because these fuels were favored and in areas where antipollution measures are in force, smokeless briquets meet the requirements. In the Nord/Pas-de-Calais four furnaces for producing "anthracine" were being completed at Rousseau plant in Valenciennes to meet increasing demands.

Lignite.—Lignite mines of Charbonnage de France in Provence in southeast France produced 1.6 million tons; of the remainder 569,000 tons were produced in Landes region and 66,000 tons in other mines. Lignite shipments to users other than miners' own use and briquetting plants totaled 1,439,000 tons: 569,000 tons to powerplants; 775,000 tons to industry; and 95,000 tons to domestic users and small industry.

Coke and Coal Chemicals.—At the end of 1964 the coke ovens of Charbonnage de France had a capacity to produce 25,600 tons of coke per day. Actual production 8.98 million[34] was at the rate of 24,530 tons per day. The principal customers for the coke produced by the coal mines was the iron and steel industry. Of 8.71 million tons of total sales by the coal basins, 5.78 million tons was sold to the iron and steel industry, 1.48 million tons to other industries, and the remainder to household, export market, and mine consumption.

Coke imports supplied 27.7 percent of all coke shipped. This does not take into account 5.66 million tons of imported coal charged to coke ovens.

In September a new battery of 27 byproduct coke ovens with 400-ton-per-day capacity started production at Mazingarbe in the Nord/Pas-de-Calais field, bringing total daily capacity of this cokery to 2,050 tons of coke. Its facilities for ammonium production were being extended. Some of the ammonia will be used for making heavy water by isotopic exchange between hydrogen and ammonia. At the Carling coke plants in Lorraine facilities for nitrogen production were being enlarged.

Coal chemicals continued to face competition from petroleum and natural gas. Benzols (benzenes, aromatics, and solvents) obtained from petroleum increased at the expense of benzols produced from coal distillation.

Investment.[35]—Investment in the coal industry (capital investment and medium term[36]) exclusive of recoverable taxes in the last 4 years were as follows in million dollars: 1961—117.9; 1962—98.4; 1963—85.0; and 1964—84.9. For 1964, $44.8 million of the expenses was classified as medium term. The breakdown of all investments in this year in million dollars were as follows: dwellings (1,382 completed during the year) 10.3; long-term investments for modernizing coal extraction 16.0; medium-term investment for coal extraction 35.5; briquetting 3.0;[37] conversion industries 20.1 (of which 15.1 was capital investment).

---

[34] Of this, 362,736 tons were semicoke and retorted agglomerates.

[35] Charbonnage de France. Rapport de Gestion 1964. 1965, pp. 87 and 89.

[36] Medium term investments are defined as those which generally do not increase production capacity but which must be carried out regularly to assure continuity of production. They include modernization of surface plants, shafts, workshops, and similar improvements underground.

TABLE 25.—France: Production, availability, and distribution of coke

(Thousand metric tons)

	1960	1961	1962	1963	1964
Coal, charged to coke ovens:					
Domestic	13,917	13,730	13,686	12,160	13,304
Imported	4,580	4,590	4,635	6,060	5,660
Total	18,497	18,320	18,321	18,220	18,964
Production:					
Coke oven:					
At mines	7,707	7,777	8,070	8,055	8,978
Nord/Pas-de-Calais	4,801	4,777	4,660	4,473	5,260
Lorraine	1,872	1,879	2,308	2,419	2,753
In iron and steel plants	4,363	4,420	4,384	4,315	4,323
By gas companies and independents	1,862	1,555	1,332	1,365	1,002
Total [1]	[2] 13,933	[2] 13,753	[2] 13,785	13,735	14,303
Semicoke	297	278	269	271	296
Gas coke	695	429	247	146	61
Availability and distribution:					
Coke produced	13,933	13,753	13,785	13,735	14,303
Coke receipts and fines	196	166	72	2	13
Consumption at coking plants and by labor	1,111	860	981	1,039	911
Available for distribution	13,018	13,059	12,876	12,698	13,405
Stock variation [3]	−85	+200	−68	−370	+333
Imports	5,070	5,530	4,694	5,916	4,958
Importers stock variation [3]	+5	+21	+50	+439	+35
Total available from domestic production and imports	18,168	18,368	17,588	18,545	17,995
Delivery to coking plants	199	160	66	5	11
Exports	123	105	160	154	144
Distribution:					
Railroads	82	78	78	116	91
Electricity	3	1	4	5	14
Iron and steel	14,470	14,829	13,791	13,675	14,515
Other industries	1,904	1,888	1,845	2,025	2,003
Domestic use and small industries	1,387	1,307	1,644	2,565	1,217
Total	17,846	18,103	17,362	18,386	17,840

[1] Total includes semicoke and distilled agglomerates.
[2] Detail does not add to total because of rounding.
[3] Plus indicates addition to stocks, minus indicates withdrawal from stocks.

Source: Bureau de Documentation Minière, Paris, France. Combustibles Minéraux Solides. Statistique Annuelle Définitive. Pt. 2, for the years 1960–64.

Research.—With the closing of the Meurchin experimental station and reduction of personnel at Marienau, research efforts were concentrated in Verneuil. Mining research and chemical research, the latter oriented toward finding new outlets for coal, represented 70 percent of this station's activities.

Total personnel of the Centre d Études et Recherches de Charbonnage (Cherchar) was 610, an increase of 27 from the previous year. Research was carried on in many fields. Health and safety, abatement of dust in mines, study of dust's harmful effects on the lungs, use of explosives, ventilation, measurement of methane, and design of Methanometers were emphasized. Research in and development of mining machinery, study of ground pressure and rock mechanics, telecommunication and distant control of machines were areas which received attention in order to assist coal exploitation.

---

[37] Mostly in long-term investment in equipment.

By contrast, work on coal washing and briquetting has been reduced to 4 percent of Cherchar's activities because many of these problems have been satisfactorily resolved. Research in coal chemicals with a view to finding new uses for byproducts continued to increase. Constitution of coal and coke, high energy fuels prepared from coal tars, high polymers, and manufacture of active carbons and special carbons for electrometallurgy were areas of chemical research. Cherchar carried out research under contract with the ECSC. The work was concerned with the propagation of methane in coal seams, rock mechanics, and fundamental research in the nature and constitution of coal and coke.

Petroleum and Natural Gas.[38]—Domestic production of crude petroleum in 1964 was 5.6 percent of the refinery throughput. Consumption of petroleum products increased to a new record of 42 million tons. Annual refining capacity (atmospheric distillation) at the end of the year stood at 61.9 million tons, an increase of 10.1 million tons from that of 1963. Imports of petroleum and petroleum products cost $1,072 million but this was partly balanced by exports of products valued at $269 million so that net cost of imports to the French economy was about $803 million. Petroleum products supplied 40.6 percent of the 1964 energy requirements and together with natural gas contributed 45.6 percent.

Exploration.—At yearend 111,500 square kilometers of area in France including offshore areas was covered by exploration and exploitation permits (128,700 square kilometers in 1963). An exploration permit in the Bay of Biscay, called Landes Atlantique with 1,558 square kilometers, was awarded to a group consisting of Société Esso de Recherches et d'Exploitation Pétrolières (Esso REP), Société Nationale des Pétroles d'Aquitaine (SNPA), and Compagnie d'Exploration Pétrolière (CEP). A permit with 2,325 square kilometers (Hourtin-Atlantique), north of Landes-Atlantique permit, was awarded to Société de Recherches et d'Exploitation Pétrolières (SOREX).

Geophysical and drilling activities declined. A total of 189,000 meters was drilled in France, compared with 236,500 in 1963. A substantial increase in the Aquitaine basin offset decrease in the rest of the country.[39] Exploratory wells discovered oil in Lower Cretaceous sandstone southeast of Paris and gas in the Triassic in an outpost well of the Lons-le-Saunier field in the Bresse basin.[40]

In the Landes permit of the Aquitaine basin, wildcat exploration and development of the Lavergne and Cazaux fields were the objectives of an active drilling program by Esso REP.[41] CEP drilled Hourtin 1 on the Atlantic Coast west of the Gironde Estuary; Lower Cretaceous was not found in the area.[42] In the Paris basin, four deep test wells in the Paleozoic in the Hercynian fold belt north of the basin were unsuccessful. As a result of drilling in this basin (26 exploratory wells which tested the Neocomian sandstone), CEP found 7.5 meters of oil saturated sandstone in Courtenay No. 7—the only oil discovery during the year. In the Jura-Bresse-Savoie, well No. 3 extended the Valempoulières gasfield 13 kilometers east of Poligny; production is from the Middle Triassic.[43]

---

[38] Comité Professionnel du Pétrole. Éléments Statistiques. Activité de l'Industrie Pétrolière. Paris, France. V. 1, for the years 1962, 1963, and 1964.

[39] King, Robert E. Petroleum Production in Europe in 1964. Bulletin of American Association of Petroleum Geologists, August 1965, p. 1177.

[40] Page 1177 of work cited in footnote 39.

[41] Page 1187 of work cited in footnote 39.

[42] Page 1187 of work cited in footnote 39,

TABLE 26.—France: Salient statistics of the petroleum and natural gas industry

(Metric tons unless otherwise specified)

	1959	1962	1963	1964
Length of hole drilled ____ thousand meters	393.7	263.8	236.5	189.1
Production:				
Crude petroleum ____ thousand tons	1,617.8	2,370.2	2,522.0	2,845.5
Natural gas ____ million cubic meters	2,614.0	6,996.0	7,518.0	7,939.0
Of which marketed ____ do	1,645.0	4,740.0	4,861.0	5,090.0
Products obtained from refining of natural gas:				
Liquefied products ____ thousand tons	140.4	423.6	437.6	490.4
Sulfur ____ do	426.3	1,345.1	1,408.5	1,510.7
Refining:				
Number of refineries	14	14	15	16
Capacity of refineries (atomospheric distillation) thousand tons	37,440.0	44,540.0	51,830.0	61,930.0
Refinery throughput ____ do	30,766.0	39,863.0	46,702.0	53,284.0
Foreign trade:				
Imports:				
Crude ____ do	29,171.0	37,161.0	43,258.0	49,275.0
Products ____ do	2,125.0	3,070.0	4,276.0	4,592.0
Exports of products including bunkering ____ thousand tons	6,512.0	7,526.0	8,006.0	8,963.0
Consumption:				
Internal market ____ do	20,890.0	30,044.0	35,902.0	41,936.0
French bunkering ____ do	1,377.0	1,518.0	1,339.0	1,376.0
Other consumption, including refinery and distribution losses (approximate) ____ thousand tons	4,100.0	4,620.0	5,000.0	[p] 5,000.0
Stock:				
In refinery ____ do	8,077.0	10,519.0	11,774.0	14,219.0
In distribution channels ____ do	3,496.0	3,914.0	4,540.0	5,161.0
Transportation:				
Tankers:				
Units	109	103	93	93
Deadweight ____ thousand tons	2,676	3,055	2,945	3,088
Tank cars:				
Units	12,050	14,191	16,150	18,719
Capacity ____ thousand cubic meters	371	511	620	782
Tank trucks:				
Units	6,535	8,019	8,248	10,220
Capacity ____ thousand cubic meters	76	99	100	126
Barges:				
Units	716	740	788	791
Capacity ____ thousand cubic meters	350	364	411	454
Coastal vessels:				
Units	43	50	51	50
Deadweight ____ thousand tons	79	100	107	105
Employment:				
Exploration and production ____ persons	11,650	10,923	11,043	10,503
Refinery ____ do	16,850	15,710	15,895	16,266
Distribution ____ do	84,750	84,550	84,600	89,590
Other ____ do	1,150	1,300	1,355	1,436
Total ____ do	114,400	112,483	112,893	117,795
Investments:				
Exploration and production ____ million dollars	452.29	277.29	[p] 301.39	NA
Tankers ____ do	53.07	----	----	NA
Pipelines ____ do	[r] .82	67.65	[p] 25.32	NA
Refinery ____ do	70.28	92.97	[p] 126.39	NA
Distribution ____ do	57.93	64.82	[p] 109.38	NA
Other ____ do	2.43	14.38	[p] 11.75	NA
Total ____ do	636.82	517.11	[p] 574.23	NA

[p] Preliminary. [r] Revised. NA Not available.

Source: Comité Professionel du Pétrole. Activité dé l'Industrie Pétrolière. V. 1, for the years 1959, 1962, 1963, and 1964, Paris, France.

---

[43] Page 1192 of work cited in footnote 39.

TABLE 27.—France: Summary of drilling activities[1]

	Oil wells	Gas wells	Dry wells	Total	Length drilled, meters
Exploration:					
1962	11		88	99	163,788
1963	4	1	101	106	168,926
1964	1	2	76	79	[p] 140,000
Development and injection:					
1962	54		22	74	82,101
1963	24		13	37	52,482
1964	16	1	11	28	[p] 46,000
Core drills:[2]					
1962				31	17,915
1963				27	15,099
1964				NA	[p] 3,000

[p] Preliminary. NA Not available.

[1] In addition dry wildcat wells were driven as follows: 1962—31; 1963—27; 1964—6.

[2] Excludes shallow depth core drills.

Crude Production.—The Aquitaine region, mainly Parentis, remained the most important productive region, accounting for 79 percent of the country's output. Oil production in this region increased by 16 percent because the Lavergne field was put on production. Esso REP was the largest producing company with 76 percent of the country's output entirely from the Aquitaine region, followed by CEP with 11 percent. Six other companies accounted for the remainder of the output.

During 1963, production was reported from 32 fields in France: 14 in the Paris basin, 9 in Alsace, and 9 in Aquitaine. Half of these fields had an annual production of less than 10,000 tons and only 3 fields, all in the Aquitaine region, had an annual production exceeding 100,000 tons: Parentis—1,374,109 tons; Mothes—102,096 tons; and Cazaux—284,817 tons. As of December 31, 1963, there were 402 wells in the producing fields—35 producing under natural pressure, 274 pumped, 1 gas lift, 65 closed, and 27 abandoned.

Trade.—Of the 6-million-ton increase in crude imports, about 3 million tons originated in the Middle East and 2 million tons in the Franc zone, so that the Middle East suppliers did not lose ground to franc zone crude but actually slightly increased their share of crude imports to 53 percent of the total. Algeria, the principal producer in the franc zone, supplied 34.7 percent of total imports. Cost of crude and product imports were $919 million and $152 million, respectively. France exported petroleum products valued at $269 million.

Of the 8.6 million tons of petroleum products exported, more than half went to Switzerland and West Germany, 2,206,000 and 2,202,000 tons, respectively, followed by the United Kingdom (903,211 tons), the Netherlands (676,887 tons), and Belgium-Luxembourg (359,065 tons). Exports of products to the franc zone totaled about 500,000 tons with 60 percent of it going to Algeria. Switzerland, the United Kingdom, and West Germany were the principal markets for gasoline; these countries together with the Netherlands were also the principal markets for distillate and residual fuels. Bunkers received 604,760 tons of distillate and residual fuel oils.

TABLE 28.—France: Petroleum production by basins and principal producing fields

(Thousand metric tons unless otherwise specified)

	1960	1961	1962	1963	1964	Principal fields
Alsace basin:						
Société Anonyme d'Exploitation Minières Péchelbronn.	22.3	20.6	14.5	6.2	5.4	Péchelbronn.
Société de Prospection et Exploitations Pétrolières en Alsace (PREPA).	41.5	33.1	29.5	27.8	25.0	Scheibenhard, Eschau.
Paris basin:						
Compagnie d'Exploration Pétrolière (CEP).	110.1	181.3	262.0	278.0	320.0	Chailly-en-Bière, St. Firmin-des-Bois, Chuelles, Châteaurenard.
Compagnie Pétrolière de Sud-Est Parisien (COPESEP).	133.7	141.9	110.7	85.1	69.5	St. Martin-de-Bossenay, Gisy.
Société Pétrolière de Recherches dans la Région Parisienne (PETROREP).	178.3	122.1	110.8	92.7	93.6	Coluommes.
Régie Autonome des Pétroles (RAP).	56.8	70.1	81.4	75.8	73.8	Villemer, Valence-en-Brie, Chartrettes.
Acquitaine basin:						
Société Esso de Recherches et d'Exploitation Pétrolières (ESSO REP).	1,345.4	1,503.2	1,674.5	1,870.0	2,176.3	Parentis, Cazaux, Mothes, Lugos, Lavergne-La Teste, Mimizan Nord.
Société Nationale de Pétroles d'Aquitaine (SNPA).	88.4	91.1	85.0	86.4	81.9	Lacq Supérieur.
Total	1,976.5	2,163.4	2,368.4	2,522.0	2,845.5	

TABLE 29.—France: Imports of crude petroleum by origin

(Thousand metric tons)

	1960	1961	1962	1963	1964
Franc zone:					
Algeria	6,496.6	11,182.7	12,699.4	15,215.0	17,113.2
Other	824.5	830.3	820.3	783.9	883.9
Total	7,321.1	12,013.0	13,519.7	15,998.9	17,997.1
Middle East:					
Iran	1,367.4	813.6	1,478.0	2,038.0	3,441.3
Iraq	7,811.8	6,893.0	7,225.9	9,259.9	8,078.8
Kuwait	7,404.0	8,752.4	8,202.8	8,084.3	9,798.5
Qatar	1,593.3	1,573.7	1,540.9	1,193.9	1,311.3
Saudi Arabia	2,981.0	2,335.4	2,083.0	1,792.7	1,945.3
Abu Dhabi	----------	----------	159.1	465.7	1,452.7
Total	21,157.5	20,368.1	20,689.7	22,834.5	26,027.9
United States	63.1	50.0	16.9	----------	----------
U.S.S.R.	139.9	112.6	86.5	113.9	92.4
Venezuela	2,293.2	2,449.1	2,597.9	2,649.3	2,594.7
Libya	----------	24.8	249.9	1,660.8	2,290.3
Other	48.3	----------	----------	----------	[1] 272.5
Grand total	31,023.1	35,017.6	37,160.6	43,257.4	49,274.9

[1] Nigeria.

TABLE 30.—France: Trade in petroleum products

(Metric tons)

	1964	EEC	Principal destinations and sources
Exports:			
Gasoline	1,490,000	403,566	Switzerland 537,657; United Kingdom 349,178; West Germany 306,845.
Kerosine (including jet fuel)	920,720	187,766	Switzerland 136,027; West Germany 87,943; United Kingdom 66,044; Netherlands 55,606; Algeria 32,489; Bunker 236,818.
Distillate fuel	2,868,000	1,304,000	Switzerland 1,044,000; West Germany 852,242; Netherlands 310,493; United Kingdom 162,216; Belgium-Luxembourg 141,571; Algeria 67,056; Bunker 92,761.
Residual fuel oil	2,760,000	1,199,000	West Germany 846,550; Switzerland 415,754; United Kingdom 283,597; Netherlands 241,777; Spain 77,297, Bunker 511,999.
Lubricants	261,953	71,693	United Kingdom 40,846; Algeria 33,253; West Germany 23,782; Belgium-Luxembourg 20,283; Italy 15,211; Morocco 13,006.
Natural gas	287,824	87,009	Spain 72,739; Belgium-Luxembourg 61,366; Portugal 57,589; United Kingdom 36,220; West Germany 13,606; Algeria 11,442.
Mineral jelly, wax	13,116	5,606	Morocco 4,824; Italy 2,924; Netherlands 1,964.
Petroleum, coke, asphalt, and other byproducts.[1]	301,709	132,870	West Germany 84,556; Switzerland 66,368; Algeria 50,880; Belgium-Luxembourg 42,827; Sweden 10,799.
Total [2]	8,941,000	3,430,000	Switzerland 2,206,000; West Germany 2,202,000; United Kingdom 903,211; Netherlands 676,887; Belgium-Luxembourg 359,065; Algeria 292,264; Spain 139,796; Libya 104,148.
Imports:			
Gasoline	604,244	102,743	Venezuela 150,520; Rumania 118,733; Algeria 107,203; Italy 87,074.
Kerosine (including jet fuel)	19.596	4,093	Kuwait 9,823; Algeria 3,725; Italy 2,536.
Distillate fuel	2,063,000	379,006	U.S.S.R. 511,298; Algeria 461,277; Italy 298,440; Rumania 242,752; Saudi Arabia 129,327.
Residual fuel oil	1,302,000	371,891	U.S.S.R. 495,438; Rumania 196,605; Netherlands 184,300; Algeria 131,901; Italy 113,490; West Germany 55,603; Iraq 49,207.
Lubricants	29,459	10,498	United Kingdom 4,015; Italy 3,683; Netherlands 3,065; West Germany 2,867.
Natural gas	66,632	47,400	West Germany 27,258; Algeria 17,184; Netherlands 7,526.
Mineral jelly, wax	66,799	3,197	Indonesia 45,304; United States 7,430; Venezuela 6,308; East Germany 3,366.
Petroleum, coke, asphalt and other byproducts.[1]	869,439	220,847	United States 465,996; West Germany 170,876; U.S.S.R. 85,946; United Kingdom 57,880.
Total [3]	5,137,000	1,253,000	U.S.S.R. 1,126,000; Algeria 704,129; Rumania 558,416; Italy 517,921; United States 500,066; West Germany 269,895; Netherlands 250,446; Venezuela 197,127; Saudi Arabia 199,820; Kuwait 118,500; Iraq 111,294.

[1] Includes pitch obtained from coal.
[2] Includes 37,674 tons of manufactured gas which was exported entirely to EEC.
[3] Includes 115,595 tons of manufactured gas which was imported, of this 113,723 from EEC.

Source: United Nations. Statistical Papers. Commodity and Trade Statistics 1964. Ser. D, v. 14, No. 1–14, 1965, pp. 2530–2752. (This source includes under distillate fuel, what the Comité Professionel du Pétrole in Elements Statistiques classifies as domestic and light fuel oil.)

Local affiliates of Esso, Shell, Mobil, and British Petroleum appealed to the Council of State, the highest court of appeal, concerning the legality of decrees issued in February 1963, regulating importation, processing and distribution of petroleum products and residues from nonfranc areas. At yearend, the Council had not given a decision.

Under a trade agreement signed by the two countries, France will import 9.2 million tons of crude oil from the U.S.S.R. during 1965–69, the annual rate increasing from 1.55 million tons in 1965 to almost 2 million tons in 1969. Union Générale des Pétroles (UGP) will refine the bulk of these imports. The agreement also envisaged the import of 76,000 tons of gasoline, 465,000 tons of gas oil, and 375,000 tons of fuel oil annually, though these quantities may be varied.[44]

In 1964 distillate and residual fuel oils constituted 68 percent of all product imports. Although 1963 imports of these products were exceptionally high, 1964 imports exceeded them by about 360,000 tons. As in the previous year, the U.S.S.R. and Rumania were important suppliers.

Consumption.[45]—Internal market for petroleum exceeded 40 million tons, 16.4 percent more than in 1964. Fuel oils have been the dominant product as shown by their share of the markets in percent for a number of years.

	1950	1953	1956	1959	1962	1963	1964
Gasoline	27.0	27.8	25.2	24.2	21.2	19.5	18.5
Motor gas oil	9.6	9.6	8.7	7.5	7.0	6.6	6.4
Fuel oils	50.4	49.6	51.7	52.6	55.5	58.1	59.6
Other products	13.0	13.0	14.4	15.7	16.3	15.8	15.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sale of all products increased compared with 1963 figures—25.5 percent for heavy fuel oils; 22.2 percent for domestic fuel oil; 12.7 percent for gas oil; 10.8 percent for white spirit; and 10.7 percent for automotive gasoline. There was a further increase in share of industry in total consumption of petroleum products at the expense of transportation. Increased use in the production of thermal electricity and gas accounted for increase in industrial consumption.

Principal customers for heavy fuel oil and its consumption in tons were: Industry 6.8 million; Electricité de France 2.79 million; French railroads 834,000; domestic space heating 378,100—making a total of 10.8 million. Sale of domestic fuel oil in tons was distributed as follows: Heating of homes 5.1 million, industrial space heating 4 million, agriculture 1.26 million, bakeries 460,300—making a total of 10.9 million.

Sale of high octaine gasoline during the year continued to increase by 16 percent, compared with 6 percent for ordinary gasoline and 10.7 percent for all gasolines. Private cars and commercial vehicles increased in millions of vehicles to 8.1 (7.0 in 1962) and all motor vehicles to 10.0 (8.8 in 1962). Increases in consumption in the Paris area were again below the national average because parking difficulties and congestion inhibited growth of road traffic.

Direct sale of propane and butane to consumers increased 11 percent to 1.26 million tons. Gasworks took 127,000 tons, 88.7 percent of which was propane.

The Paris area was the largest market for petroleum products with 23 percent of the total in 1963, followed by Nord/Pas-de-Calais, the next largest consuming area with 7.45 percent.

---

[44] Petroleum Press Service (London). December 1964, p. 473.

[45] Equivalent to sales to civilian users. The figures do not take into account refineries own consumption, refinery, storage and transportation losses or change in the stocks of consumers and retailers.

TABLE 31.—France: Estimated breakdown of petroleum consumption by end users

(Thousand metric tons and percent)

	1963		1964	
	Quantity	Percent	Quantity	Percent
Transport:				
Road	8,887	23.5	9,962	22.6
Coastal and river	508	1.3	545	1.2
Maritime	2,006	5.3	2,197	5.0
Railroad	1,245	3.3	1,191	2.7
Air	798	2.1	876	2.0
Agriculture	1,670	4.4	1,713	3.9
Domestic space heating and other domestic use	6,641	17.5	7,712	17.5
Industry:				
Thermal electricity	1,608	4.2	2,949	6.7
Production of gas	330	.9	665	1.5
Production of steam	5,612	14.8	6,477	14.7
Furnace use	4,175	11.0	4,954	11.2
Bakeries	491	1.3	487	1.1
Lubrication	155	.4	165	.4
Road pavement	1,641	4.3	1,713	3.9
Unspecified	1,572	4.2	1,882	4.2
Other consumption	569	1.5	646	1.4
Total	37,908	100.0	44,134	100.0

Transportation and Distribution.—In 1964, 91.3 percent of the crude received in French ports was carried in French tankers. As of the end of the year, France had 93 tankers with 3,088,000 deadweight tons distributed in size categories as follows: 3—75,000 or more; 11—50,000 to 74,999; 7—40,000 to 49,000; 33—30,000 to 39,999; 38—15,000 to 29,999; and 1—10,000 to 14,999. Sixty-five have been put into service since 1955. For internal transportation, there were 791 barges in 1964 with a total capacity of 453,934 cubic meters; 16,085,253 tons of oil were carried by river transportation.

The capacity of the South European crude pipeline from Lavera was increased to 25 million tons of crude per year; seven pumping stations were in service. The capacity of the product pipeline from Le Havre to Paris (Trapil) was being tripled[46] and the construction of a gas pipeline from Le Havre to Paris had been started. The total capacity of the three lines of Trapil is 5 to 5.5 million tons per year. In 1964 the South European pipeline transported 20 million tons of crude (8.7 million in 1963), the Trapil line moved 4 million tons of products (3.2 million in 1964), and the Parentis-Ambes pipeline transported 2.2 million tons of crude.

The Feyzin refinery will be served by a 906-kilometer pipeline that was to be started in 1964. The main 18-inch line will run from Étang de Berre on the Mediterranean up the Rhône valley to Lyon, with branches up to Dijon, east to Geneva, Switzerland, and west to St. Étienne. The initial throughput capacity will be 5 million tons per year and will be increased to 9 million tons by 1975.[47]

---

[46] Le Havre to Juvisy—243-kilometer, 10 inch line. Gonfreville to St. Ouen—184-kilometer, 12 inch line. Petit Couronne-Gennevilliers 112-kilometer, 20 inch line. Port Jerome (where Esso refinery is located) to Petit Couronne, a 40-kilometer line, is under construction.

[47] Petroleum Press Service (London). July 1964, p. 272.

TABLE 32.—France: Petroleum supply position

(Million metric tons)

	1962	1963	1964
Crude oil supply:			
Production from franc zone:			
France	2.37	2.52	2.85
Algeria and Sahara	20.70	23.89	26.49
Gabon and Congo	.95	1.00	1.14
Total	24.02	27.41	30.48
Imports from outside franc zone:			
For French refineries [1]	20.51	24.40	26.60
For custom refining [1]	3.49	3.82	5.76
Total [1]	24.00	28.22	32.36
Withdrawals from stocks		.02	.05
Total crude available for refining or exports	48.02	55.65	62.89
Crude oil disposal:			
Loss and local sales	.36	.31	.27
Additions to stocks	.58	.50	.56
Exports (from franc zone production, largely Algerian crude)	7.18	8.14	8.77
Shipments to French refineries for processing	39.90	46.70	53.29
Total	48.02	55.65	62.89
Refinery operations:			
Refinery feed	39.90	46.70	53.29
Changes in stocks of partly refined products	.04	3.90	4.42
Refinery consumption and losses	3.31		
Refinery product output	36.55	42.80	48.87
Refinery product supply:			
Production [1]	36.55	42.80	48.87
Imports [1]	3.04	4.40	4.27
Withdrawals from refinery stocks	.12		
Withdrawals from distributors stocks	.15		
Hydrocarbon extracts produced from natural gas and other unspecified additions to product supply	.53	.51	.62
Total products available for consumption or exports	40.39	47.71	53.76
Refinery product disposal:			
Additions to refinery stocks		1.00	.60
Additions to distributors stocks		.40	.24
Shipments for use:			
French market:			
Motor gasoline	6.36	6.93	7.69
Jet fuel	.59	.68	.78
Gas oil	2.11	2.36	2.66
Domestic heating oil	6.90	9.03	11.03
Light fuel oil	2.89	3.00	2.83
Heavy fuel oil	6.90	8.66	10.88
Liquefied petroleum gas	1.11	1.29	1.38
Petrochemical feedstock	.68	.80	p 1.00
Lubricants	.57	.60	.64
Bitumen	1.45	1.64	1.77
Other	.75	.91	1.28
Total	30.31	r 35.90	41.94
Other markets and adjustments	1.03	1.10	1.05
Bunkering of French ships	1.52	1.34	1.34
Total French market	32.86	38.34	44.33
Ships to other franc-zone countries	2.00	1.90	.92
Bunkering of foreign ships	.56	.67	.53
Exports	4.97	5.40	7.14
Total non-French market	7.53	7.97	8.59
Grand total refinery product disposal	40.39	46.31	52.92

p Preliminary. r Revised.

[1] Data presented differ slightly from those given elsewhere in the chapter because of differences in sources.

Work was begun on the 156-kilometer 20-inch pipeline that will bring Saharan methane from the installation at Le Havre to the Paris area starting early in 1965. There were 45,450 gas stations in 1964 (44,950 in 1963).

Refining.—During 1964, French refineries treated 53.3 million tons of crude petroleum with a gross output of 50.4 million tons of products and a net output of 48.8 million tons, 14.2 percent more than in 1963. In 1964, residual fuel oils accounted for 33 percent, and domestic fuel oil (a distillate cut) for 21 percent of gross production. Other products in percent were as follows: Gasolines 19; distillate fuel oil 10; bitumen 4; propane and butane 3; and noncondensable gases 2. These percentages differed little from those of 1963.

TABLE 33.—France: Production of refinery products

(Thousand metric tons)

	1955	1961	1962	1963	1964
Refinery throughput	25,086	37,074	39,863	46,702	53,284
Aviation gasoline	8	92	88	69	66
Motor gasoline	5,110	6,930	6,983	7,943	8,643
Special gasolines	54	224	249	423	825
Kerosine and white spirits	504	475	383	404	260
Jet fuels	407	1,179	1,371	1,542	1,662
Fuel oil:					
Distillate	3,739	4,415	4,352	4,756	5,091
Domestic	1,508	4,883	6,463	8,609	10,691
Residual	9,685	12,094	12,516	14,643	16,623
Asphalt	1,087	1,590	1,641	1,777	2,172
Lubricants	541	696	777	813	871
Paraffin and waxes	24	34	41	42	49
Petrochemical feedstock	34	363	433	503	582
Liquefied petroleum gas	476	1,023	1,117	1,352	1,487
Refinery gases	79	832	951	1,105	1,279
Other	110	118	244	113	75
Total	23,366	34,948	37,609	44,094	50,376

Source: Comité Professionnel du Pétrole. Activité de l'Industrie Petrolière. V.1, for the years 1962–64 Paris, France, p. B. 41.

The Feyzin refinery of the Union Générale des Pétroles (UGP) went on stream in June. Addition of this refinery and expansion of existing ones increased annual refinery capacity (atmospheric distillation) to 61.9 million tons distributed as follows in thousand tons: Lower Seine 20,800; Mediterranean coast 18,530; Atlantic 8,100; Alsace 7,000; North 5,500; and Lyon 2,000. Total refinery capacity may be increased to 70 million tons by 1975.

UGP received official authorization to build a 2.8 million ton per year refinery near Mélun, about 60 kilometers southeast of Paris. Esso was authorized to build at its Port Jerome refinery a new steam cracking unit with capacity of 200,000 tons of ethylene and 45,000 tons of butadiene per year. This unit will replace the much smaller existing steam cracker and is expected to be completed by 1967.

Negotiations for a revision of the intercompany arrangements for petroleum products was in progress during the year. These arrangements have been in force since 1951 and were designed to eliminate unnecessary cross transportation of products.

In view of the forthcoming operation of its new refinery at Fos, Esso is seeking to reduce its purchase of products from the Compagnie

Française de Raffinage, the refining affiliate of Compagnie Française des Pétroles.

The 16 refineries which were in operation in 1964 were owned by 10 companies (treating Union Industrielle des Pétroles and Union Générale des Pétroles as two separate companies). Ownership of refinery capacity by companies was as follows in thousand tons per year: Compagnie Française de Raffinage 16,600; Compagnie de Raffinage Shell-Berre 12,000; Société Française des Pétroles B.P. 9,900; Esso Standard S.A.F. 6,000; Antar 3,850; Compagnie Rhenane de Raffinage 3,700; Raffinage Strasburg S.A. 3,300; Mobil Oil Française 2,830; Union pour le Raffinage et la Petrochimie 2,000; Union Industrielle des Pétroles (UIP) 1,750.

Reforming and cracking facilities included catalytic cracking in 9 refineries; thermal reforming in 6; catalytic reforming in 15; and thermal cracking in 4.

TABLE 34.—France: Capacities of petroleum refineries, 1964

(Thousand metric tons per year)

Company and location	Atmospheric distillation	Principal secondary processing facilities			
		Thermal reforming	Catalytic reforming	Thermal cracking	Catalytic cracking
Antar Pétroles de l'Atlantique: Donges	3,850	750	2,100	----------	1,600
Sociéte Française des Pétroles B.P.:					
Lavéra	4,400	635	1,000	----------	----------
Dunkirk	5,500	----------	1,600	----------	----------
Compagnie Française de Raffinage:					
Gonfreville	10,200	1,660	1,800	----------	2,665
La Mède	6,400	1,820	2,400	300	1,627
Esso Standard of France:					
Bordeaux	2,000	----------	670	----------	----------
Port-Jérôme	4,000	----------	1,660	----------	3,040
Mobil Oil Française:					
Frontignan	1,730	----------	600	----------	1,500
Gravenchon	1,100	----------	600	----------	----------
Union Industrielle des Pétroles: Ambès	1,750	520	480	----------	900
Compagnie Rhénane de Raffinage: Reichstett-Venheim	3,700	----------	2,000	3,000	----------
Compagnie de Raffinage Shell-Berre:					
Berre-l'Étang	6,000	1,400	2,000	1,000	2,300
Pauillac	500	----------	----------	----------	----------
Petit-Couronne	5,500	----------	1,700	1,000	2,700
Société de Raffinage de Strasbourg: Herrlisheim-Drusenheim	3,300	----------	2,500	----------	----------
Union pour le Raffinage et la Pétrochemie: Feyzin	2,000	----------	260	----------	660
Total	61,930	6,785	21,370	5,300	16,992
Under construction:					
Antar Pétroles de l'Atlantique: Rennes	1,200	NA	NA	NA	NA
Esso Standard of France, Inc.: Fos-sur-Mer	2,500	NA	NA	NA	NA
Union Générale des Pétroles: Grandpuits	2,800	NA	NA	NA	NA

NA Not available.

Natural and Manufactured Gas.—Of the 7,939 million cubic meters of crude natural gas produced in 1964, 7,627 million cubic meters were obtained from the Lacq field. Recoverable reserves of Lacq as of January 1, 1964, were reported at 148 billion cubic meters of crude gas; reserves of Saint Marcet are 2.7 billion cubic meters.

In 1964, 5,080.9 million cubic meters of natural gas were sold[48] to the following: Gas de France—1,719 million; production of electricity—989 million; chemical and parachemical industries—1,446 million; lime, glass and ceramic industries—284 million; and iron and steel industry—213 million. The remainder, except for 40 million cubic meters used as motor gasoline condensate, was shipped to other industries. Of the total natural gas sales, Aquitaine, where the gas is produced, took 29.8 percent; the Paris region 22.0 percent; Midi-Pyrénées 16.4 percent; and Rhône-Alpes 12.41 percent.

Production of refinery gases increased because of larger refinery throughput; similarly, blast furnace gas which had not shown much variation during 1959–63 increased in 1964. On the consumption side, use of gas for power production showed a decline in 1964 but this was more than compensated for by larger use by the chemical industry.

TABLE 35.—France: Production, availability, and distribution of natural and manufactured gas

(Billions of kilocalories[1])

	1960	1961	1962	1963	1964
Production:					
Gasworks gas	8.5	5.9	5.5	6.0	5.6
Coke oven gas	23.9	24.2	24.8	24.7	26.5
Drained methane	.5	.6	.5	.5	.6
Blast furnace gas	51.7	52.7	48.6	45.7	48.1
Refinery gas	11.5	14.1	[r] 17.9	23.2	25.2
Natural gas	27.3	37.4	43.5	45.7	48.2
Total	123.4	134.9	[r] 140.8	145.8	154.2
Imports and from stocks	2.6	3.0	3.8	4.1	3.8
Available gross	126.0	137.9	[r] 144.6	149.9	158.0
Consumption for heating coke ovens, other uses, loss, and stocks	49.4	52.8	[r] 49.7	55.0	57.9
Available, net	76.6	85.1	[r] 94.9	97.9	100.1
Industrial:					
Electricity	25.3	28.7	[r] 28.7	25.2	23.6
Iron and steel	17.3	17.9	[r] 18.5	18.3	19.2
Mechanical and electrical	1.5	1.8	2.1	2.4	2.5
Chemical	10.9	13.6	[r] 19.1	19.9	23.3
Other	5.0	5.9	6.9	7.0	7.9
Subtotal industrial distribution	[2] 60.1	[2] 68.0	[r] 75.3	72.8	76.5
Distribution:					
Domestic	11.0	11.6	13.1	15.2	16.3
Commercial	2.4	2.6	3.0	3.4	3.7
Gasoline	.6	.6	.5	.5	.6
Exports and loss	2.5	2.3	3.4	3.0	3.0
Total distribution	76.6	85.1	[2] [r] 94.9	94.9	100.1

[r] Revised.

[1] 1,000 kilocalories is equivalent to 0.15 standard coal equivalent. Volume of gas in cubic meters is 4,200 kilocalories per cubic meter and it can be obtained by dividing number of kilocalories by 4,200.

[2] Detail does not add to total because of rounding.

Source: Comité Professionel du Pétrole (— France). Elements Statistiques. Activité de L'industrie Petrolière 1964. V. 1, 1965, p. A–15.

---

[48] To be distinguished from "delivered for marketing" which would include increase or decrease in stock.

The Mineral Industry of East Germany

By Roman V. Sondermayer[1]

◆

EAST GERMANY'S economy continued to depend upon substantial imports of mineral raw materials in 1964, because of a lack of a basic natural foundation for a strong mineral industry. Government efforts continued to develop mineral-production facilities. About 1 billion marks was invested in the mineral industry but this had little effect on the level of raw-material imports. Principal mineral products, with output expressed in approximate percentages of 1963 world totals, were fuel briquets, 49 percent; brown-coal coke, 22 percent; potash, 17 percent; coal, 13 percent; and salt and silver, 2 percent each.

East German trade in minerals and mineral products was mostly limited to other Communist countries and was of minor significance to the world economy. There was no mineral trade with the United States.

The major efforts in the mineral industry were concentrated on production of brown coal, development of facilities for production of chemicals from brown coal, and continued expansion of iron and steel works near Eisenhüttenstadt and the steel plant in Freital, with emphasis on production of high-quality steel. The Werra potash plant was undergoing expansion. Although some parts of the large Schwarze Pumpe brown-coal combine near Cottbus came into production, the complex was incomplete at yearend.

The Government, with Soviet assistance, organized extensive oil and gas exploration on the shores of the Baltic Sea; however, depth of productive formations was not published. The expansion of the Schwedt refinery, at the western terminal of the Druzhba pipeline from the U.S.S.R., continued. Plans called for completion of work in 1965, doubling the 2-million-ton annual crude throughput capacity of 1964.

The overall activity of the mineral economy was greater than in 1963 but far behind expectations; new economic measures (labor pay scaled to profit) failed to develop laborers' enthusiasm and to create a favorable atmosphere for increased productivity.

---

[1] Foreign mineral specialist, Division of International Activities.

PRODUCTION

Information on production of nonferrous metals was withheld except for aluminum and copper ore. However, it is known that lead, zinc, tin, nickel, and uranium were produced. Facilities for brown-coal production and processing, together with those for production of potash, were the most advanced segments of the mineral industry. Governmental efforts were concentrated on improving and increasing metal production. Mineral-industry-production efforts, as many other aspects of East Germany's economic life, were assisted by the Soviet Union, but, in most cases, assistance was geared to cover the needs of the U.S.S.R.

TABLE 1.—East Germany: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity[1]	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Alumina	58,900	58,200	[r] 59,820	61,072	[e] 62,000
Aluminum [e]	40,000	45,000	[r] 45,000	[r] 45,000	[e] 45,000
Copper ore ... thousand tons	1,613	1,687	1,700	1,626	[e] 1,700
Iron and steel:					
Iron ore ... do	1,642	1,643	1,642	[r] 1,661	[e] 1,650
Pig iron ... do	1,995	2,031	2,075	[r] 2,150	2,260
Steel ingots ... do	3,337	3,444	3,622	3,626	3,852
Rolled products ... do	2,613	2,703	2,798	2,813	[e] 2,900
Nonmetals:					
Cement ... do	5,032	[r] 5,275	[r] 5,432	5,460	5,772
Fertilizers:					
Nitrogenous (N content) ... do	333	330	338	340	[e] 340
Phosphatic (P_2O_5 content) ... do	166	172	181	196	[e] 200
Gypsum, calcined	215,000	[r] 214,529	228,132	214,329	[e] 220,000
Lime[2] ... thousand tons	2,800	2,827	3,344	3,457	3,500
Potash, crude ... do	1,666	1,675	1,752	[r] 1,845	1,935
Sulfur (content of pyrite)	47,000	41,000	42,000	44,000	45,000
Mineral fuels:					
Coal:					
Bituminous ... thousand tons	2,721	2,671	[r] 2,575	2,483	[e] 2,500
Brown ... do	225,465	236,926	[r] 246,992	254,219	[e] 260,000
Brown-coal briquets ... do	56,052	57,996	59,727	60,256	[e] 60,000
Coke from:					
Bituminous coal[3] ... do	3,206	3,084	3,122	3,262	3,262
Brown coal[4] ... do	7,699	7,665	7,661	7,568	[e] 7,600
Manufactured gas ... million cubic feet	123,900	124,500	130,400	[r] 133,172	[e] 140,000
Petroleum: Refinery products: gasoline ... thousand tons	1,080	1,167	1,268	1,316	[e] 1,400

[e] Estimate. [r] Revised.

[1] In addition to reported commodities, East Germany was a known producer of the following (figures represent approximate order of magnitude): Copper 35,000; lead 26,000; nickel 100; tin 600; zinc 4,000; fluorspar 75,000; salt 2,000,000; and peat 500,000.

[2] All types, including industrial.

[3] Includes gas coke.

[4] Includes high-temperature coke.

Source: Statistisches Jahrbuch der Deutschen Demokratischen Republik 1964 (Statistical Yearbook of the German Democratic Republic for 1964), Berlin, 1965, 580 pp.

TRADE

The trade pattern and the size of East German mineral and semimanufactured product exchanges remained about the same as in recent years, in spite of increased production in 1964. The country remained dependent upon imports to provide a major part of its supplies of minerals and metals and a significant portion of its processed mineral product requirements, while it exported mostly semifinished and finished products. The basic geographic pattern of trade was not evident in official East German statistics, but reports from other countries showed that the largest share of trade in minerals and related products has been with the U.S.S.R. and other Communist countries.

TABLE 2.—East Germany: Officially recorded exports of minerals

(Metric tons unless otherwise specified)

Commodity [1]	1962	1963
Nonmetals:		
Cement ... thousand tons	181	444
Gypsum, burned	35,819	37,045
Potassic materials (K_2O equivalent) ... thousand tons	1,147	1,161
Sulfur	41,719	20,642
Mineral fuels:		
Coal:		
Bituminous	600	580
Brown-coal briquets ... thousand tons	6,602	6,981
Brown-coal coke ... do	114	43
Petroleum:		
Refinery products:		
Gasoline	387,982	418,790
Diesel oil	369,904	433,632
Natural and manufactured gas ... million cubic feet	207	677

[1] Official import statistics of the Soviet Union and Poland indicate that East Germany also exported quantities of the following mineral commodities: Steel semimanufactures, fluorspar, graphite, cryolite, kaolin, mica, asphalt, paraffin, other petroleum products (in addition to gasoline and diesel oil), and carbon black.

Source: Statistisches Jahrbuch der Deutschen Demokratischen Republik 1964 (Statistical Yearbook of the German Democratic Republic for 1964), Berlin, 1965, 580 pp.

TABLE 3.—East Germany: Officially recorded imports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:		
Aluminum:		
Bauxite	285,941	327,240
Alumina, calcined	17,001	18,312
Chromite, Cr_2O_3 content	34,861	16,511
Iron and steel:		
Iron ore, Fe content ... thousand tons	1,260	1,333
Pig iron ... do	629	657
Semimanufactures, including materials for rerolling ... do	2,192	2,688
Manganese ore, Mn content	87,899	86,566
Nonmetals: Pyrites, sulfur content	94,125	90,076
Mineral fuels:		
Coal:		
Anthracite and bituminous ... thousand tons	8,881	8,849
Brown ... do	5,727	5,787
Coke ... do	2,966	3,230
Petroleum, crude ... do	2,591	3,163
Natural and manufactured gas ... million cubic feet	[r] 2,751	2,232

[r] Revised.

[1] Distribution of imports by origin not reported; data do not include a number of commodities reported as exported to East Germany in trade statistics of other countries.

TABLE 4.—East Germany: Imports of selected metals and minerals from the Soviet Union

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:		
Aluminum	41,600	53,800
Cadmium	142	200
Chromite	17,000	6,000
Copper:		
Ingot:		
Unalloyed	30,600	33,000
Alloyed (bronze)	2,200	1,700
Rolled products	----------	800
Iron and steel:		
Iron ore thousand tons	2,521	2,445
Pig iron do	624	660
Ferroalloys do	1	1
Scrap do	99	159
Steel:		
Other rolled products thousand tons	1,423	1,357
Pipe do	120	88
Lead	29,700	37,300
Manganese:		
Ore	216,000	209,000
Peroxide	3,600	1,100
Mercury 76-pound flasks	6,873	9,715
Zinc	25,900	25,900
Nonmetals:		
Apatite:		
Ore	26,200	16,500
Concentrate	593,500	640,000
Asbestos	14,000	17,600
Graphite	1,700	2,600
Pyrites	190,000	177,000
Mineral fuels:		
Coal:		
Anthracite thousand tons	892	292
Bituminous do	5,893	5,546
Coke, metallurgical do	1,378	1,511
Petroleum:		
Crude do	2,437	3,060
Refinery products:		
Gasoline do	197	231
Kerosine do	----------	----------
Diesel fuel do	272	352
Lubricants do	4	21
Unspecified do	27	41
Total do	500	645

Source: Compiled from Vneshnaya Torgovlya SSSR Za 1963 (Foreign Trade of the U.S.S.R. for 1963), Moscow, 1964, 235 pp.

COMMODITY REVIEW

METALS [2]

As in the past, systematic, detailed, and complete reporting of metal-mining and metallurgical operations has not been presented by the East German Government. However, reports indicate that the generally unpublished but definitively planned targets for production of both ferrous and nonferrous metals were met. Development of a metallurgical industry composed largely of small plants and based on imported raw materials continued. The industry reportedly encountered operational difficulties stemming from frequent changes in rolling processes and time schedules necessitated by numerous orders for small lots of a wide variety of products.

---

[2] Where necessary, values have been converted from East German marks at the rate of East German mark 1=U.S. $0.2688.

Plans for 1965 called for production increases aimed at a profit increase of $4 million over that originally proposed in 1964 (an unreported figure). As a part of this increase, the Freiberg Mining and Metallurgical combine reportedly will produce new products for electronic applications, including semiconductor germanium monocrystals.

Aluminum.—Production of aluminum based on imported bauxite from Hungary and Yugoslavia was on the same level as in 1963. Most development was concentrated on better utilization of existing facilities. The Rackwitz Light Metal Works was to become a producer of semifinished pressed products and foils for packing. Reconstruction and expansion of the plant began in summer of 1964, and production was expected to start in mid-1965.

Iron and Steel.—Development of facilities for production of iron and steel and related products with Soviet assistance continued. Emphasis was put on production of high-quality steel. Thus, output of precision-machining steels and special and light shapes has been increasing at a more rapid rate than that of regular steel. Capacity for the production of semifinished products was concentrated in enterprises controlled by the Association of People Owned Steel and Rolling Mill Enterprises (VVB Stahl-und Walzwerke). During 1964 some 36 percent of the total investment funds at the disposal of the Association was spent for new construction and for modernizing plants. The further extension of the Eisenhüttenkombinat-Ost in Eisenhüttenstadt will be carried out according to Soviet design data. When completed in 1972 the combine will be fully integrated, from pig iron to rolled-steel production. The installation of multiple-chamber electron-beam smelting furnaces at the Freital steel plant made possible the production of high-quality steel for ball bearings and electronic tubes.

Tin.—In the principal area of the tin deposits (the Zinnwald district of the Erzgebirge), the Altenberg mine alone produced 400,000 tons of ore during 1964. The mine was automated to a large extent. Tin content of ore reportedly was 0.3 percent.

NONMETALS

Mineral Fertilizers.—Agricultural difficulties forced the Government to devote large investment funds to the development of mineral-fertilizer-production facilities and at the same time to take measures to assure adequate imports of fertilizers that could not be produced in sufficient quantities in the country. Development of potash mines and other facilities continued. A total investment of $20 million was planned and partially committed for improvement and expansion of the Werra potash combine. This complex was scheduled to produce 40 percent of the East German potash output when modifications are completed about 1970. Production will come from four mines and two processing plants.

A contract for construction of a large fertilizer complex at Schwedt an der Oder, near the Polish border, was awarded to a British firm. The facility, to be near the Schwedt oil refinery, reportedly will include the world's largest nitric acid plant (capacity of 200,000 tons per year), an installation that is to be erected by the French concern, Schneider Creusot.

Cement.—Activities of the cement industry were limited to improving existing facilities in 13 operating plants that produced nearly 6 million tons in 1964 and met the needs of the country.

Lime.—A new lime quarry was put in operation near the town of Bernburg. The quarry had a daily capacity of 7,000 tons of limestone; 5,000 tons of the daily output was moved to the "Fortschritt" cement plant at Bernburg by 25-ton capacity, Soviet-made trucks. The balance of the output was consumed by the soda plant at Schachofen.

MINERAL FUELS

Coal.—The activities of the coal industry were concentrated on the development of new brown-coal mines and construction of the Schwarze Pumpe combine. Several new opencast coal mines were commissioned, of which the most important were those in the Borna field and in the Leipzig area. With these developments, the total East German coal capacity was increased by 20 million tons. The low rank of the coal required continued extensive research aimed at upgrading the coal and transforming it into more readily useable forms of energy.

The Schwarze Pumpe combine in the Cottbus region, in partial operation since 1959, was expanded with new facilities for briqueting and coal gasification. In addition, foundations were laid for 20 new coke-oven blocks of 4 ovens each. When completed in 1970, the combine will process about 40 million tons of brown coal a year and will produce about 30 million tons of coal briquets, 1.8 million tons of coke, and 168 billion cubic feet of gas.

Petroleum and Natural Gas.—According to reports, intensive exploration with Soviet assistance and equipment led to the first significant discovery of oil in East Germany. Details on the size and depth of this discovery in the vicinity of Rostock near Stralsund were withheld.

The Schwedt refinery, at the western terminal of the Druzhba crude oil pipeline from the U.S.S.R., was undergoing a major expansion. The second phase of refinery development, scheduled for completion in late 1965, will raise annual throughput capacity to 4 million tons from the present 2 million. A new plant for production of lubricants went on stream in the Lützkendorf refinery in the Halle district. As a result, the yearly throughput capacity of the refinery reportedly will be increased by 200,000 tons of crude oil.

Manufactured Gas.—Completion of a unified gas pipeline and storage system in East Germany continued to be one of the major aims of long-term planning. The area has been forced to import gas from the Federal Republic of Germany during winter months because of lack of capacity to store gas produced in excess of consumer needs during the summer until the peak demand during winter. This has also required the brown-coal gasification works to operate at reduced capacity during the summer. To reduce the need for imports, authorities started to build underground gas storage facilities near Ketzin in the Magdeburg district. A porous sandstone layer at a depth of 300 meters was selected as the storage zone. Development of the distribution system continued with the completion of a 33-kilometer pipeline from Anklam to Ueckermünde and of a line leading from Ueckermünde toward Rostock-Schwerin.

The Mineral Industry of the Federal Republic of Germany

By Justin B. Gowen [1]

❖

WEST GERMANY'S gross national product (GNP) in 1964 was valued at more than $103,000 million representing an increase of 9.9 percent over that of 1963 and continuing a trend which has shown an average annual increase, at current prices of about 8.5 percent since 1960. The processing and manufacturing industries' contribution was valued at about $34.7 billion, 10.3 percent greater than that of 1963, while construction contributed $8.4 billion, an increase of 17.5 percent.

Leading the mineral-based industries in increase in gross sales were nonferrous metals (+23 percent), iron and steel (+18 percent), and nonmetals (+17 percent). The mineral-based industry groups listed in table 1 registered a gain of 11 percent in the value of sales, accomplished with a labor force 1 percent higher than in 1963. Total industrial employment in 1964 averaged 8,301,100 of which 497,000 were engaged in mining and quarrying (a reduction of about 4 percent from 1963) and 651,000 were engaged in mineral and metal processing (an increase of about 2 percent).

TABLE 1.—Federal Republic of Germany: Employment and sales in mineral based industries

Industry	Employment [1] (thousand persons)		Sales (million dollars)					
			1963			1964		
	1963	1964	Domestic	Foreign	Total	Domestic	Foreign	Total
Mineral based industries:								
Coal mining	461	445	1,906	522	2,428	1,839	487	2,326
Nonmetals	259	266	2,342	74	2,416	2,737	84	2,821
Iron and steel	353	352	3,398	944	4,342	4,097	1,025	5,122
Nonferrous metals	84	85	933	184	1,117	1,170	209	1,379
Machinery	1,044	1,045	5,493	2,535	8,028	5,976	2,777	8,753
Transportation equipment	470	490	3,765	1,879	5,644	4,039	2,235	6,274
Shipbuilding	84	81	362	267	629	388	259	647
Electrical	919	934	5.303	1,158	6,461	5,807	1,312	7,119
Chemical	503	513	5,175	1,703	6,878	5,771	1,941	7,712
Total [2]	4,177	4,211	28,677	9,266	37,943	31,824	10,329	42,153

[1] Average monthly.
[2] Includes in employment total for 1963, total mining 517 and for 1964 total mining 497.

Source: Statistisches Bundesamt (Wiesbaden). Wirtschaft und Statistik. No. 6, June 1965, p. 383.

---

[1] West Europe specialist, Division of International Activities.

GOVERNMENT POLICIES AND PROGRAMS

The new mining code of December 10, 1964, covering ore and salt mines and nonmetallic mineral operations (except coal mines) in the mining districts of Bonn and Cologne was to be put into effect on January 1, 1965, to replace the existing North Rhein-Westphalian laws of October 16, 1956, and January 1, 1957, which were to become invalid on that date.

The new code is concerned mainly with health and safety in mine, quarry, and ancillary operations, and it places greater responsibility and control with the Federal Mining Authority than in the past.

Regulations pertaining to labor qualifications from a health and safety standpoint, responsibility for supervision, and safety regulations in working places are more stringent and more accurately defined than heretofore.

PRODUCTION

Although the mining industry lagged behind industry as a whole because of a decrease in domestic coal consumption and a decline in iron ore production, the Federal Republic maintained its position as West Europe's leading producer and consumer of mineral and metal products. As a world producer, the country ranked first in the production of pumice; second in barite, feldspar and potash; third in cement lime and pig iron; fourth in diatomite, salt, and steel; and fifth in china clay. West Germany also was among the first 10 in world production of aluminum, refined copper, graphite, gypsum, refined lead, and slab zinc.

TABLE 2.—Federal Republic of Germany: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum and alloys:					
Bauxite	3,812	4,232	4,657	4,331	4,158
Alumina and aluminum hydroxide, Al_2O_3 content ... thousand tons	510	513	517	547	519
Metal:					
Unalloyed:					
Primary ... do	169	173	178	209	220
Remelted, including scrap ... do	21	19	19	16	20
Alloyed, including some remelted scrap ... thousand tons	113	117	123	141	169
Semimanufactures ... do	203	234	246	255	316
Crude castings ... do	119	120	120	130	159
Bismuth	119	108	131	126	175
Cadmium	409	432	254	223	320
Chromium	NA	NA	NA	NA	[e] 300
Cobalt	1,525	[r] 1,617	1,646	1,508	1,445
Copper and copper alloys:					
Copper in ores, recoverable [1]	1,778	[r] 1,658	[r] 1,844	[r] 2,282	1,566
Blister, copper content ... thousand tons	62	64	69	67	67
Refined, unalloyed:					
Electrolytic ... do	234	232	238	235	239
Other ... do	75	72	70	68	98
Semimanufactures ... do	623	650	577	593	760
Crude castings, including bronze ... do	93	98	85	82	95
Gold ... thousand troy ounces	85	81	137	127	109
Iron and steel:					
Iron ore ... thousand tons	18,869	18,866	16,643	12,898	11,613
Spiegeleisen and blast furnace ferromanganese ... thousand tons	278	271	275	290	287
Pig iron ... do	25,461	25,160	23,976	22,619	26,895
Electric furnace ferroalloys ... do	151	148	112	105	131

See footnotes at end of table.

TABLE 2.—Federal Republic of Germany: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals—Continued					
Iron and Steel—Continued					
Steel ingots and other primary forms:					
Basic bessemer thousand tons	14,906	14,368	13,211	12,440	12,239
Open hearth do	16,087	15,457	15,048	14,017	16,836
Electric do	2,174	2,365	2,567	2,647	2,998
Oxygen blown do	863	1,201	1,684	2,452	5,226
Other do	70	67	53	41	40
Total do	34,100	33,458	32,563	31,597	37,339
Of which:					
Ingots do	33,428	32,728	31,893	31,022	36,701
Castings do	672	730	670	575	638
Finished steel:					
Wire rod do	2,172	2,094	2,063	2,216	2,767
Other bars and rods do	6,058	6,041	5,307	5,122	5,937
Angles, shapes and sections (excluding rails) thousand tons	1,926	2,109	2,082	1,918	2,187
Universal plates do	381	386	359	315	381
Other heavy plates and sheets (+4.75 mm thick) thousand tons	3,579	3,472	3,497	3,035	3,720
Medium plates and sheets (3 mm to 4.75 mm) thousand tons	467	435	423	476	562
Fine plates and sheets (less than 3 mm) thousand tons	3,229	[r] 2,998	3,392	3,572	4,315
Hoop and strip do	2,616	2,274	2,549	2,437	3,058
Rails and railway track material do	675	601	557	567	516
Seamless steel tubes do	1,427	1,452	1,360	1,333	1,510
Total finished steel do	[r] 22,530	[r] 21,862	[r] 21,589	[r] 20,991	24,953
Selected semimanufactures:					
Tin plate do	404	[r] 401	[r] 454	494	545
Galvanized and ternplate do	241	253	258	233	308
Steel pipe, welded do	606	579	[r] 692	566	707
Wide strip coils for processing elsewhere in Germany or other countries of ECSC thousand tons	1,001	923	1,156	1,436	1,810
Extrusions and forgings do	564	584	[r] 483	436	517
Steel castings do	360	394	356	300	341
Lead and lead alloys:					
Lead in ores do	50	50	50	52	49
Smelter:					
Primary do	148	141	148	140	107
Secondary do	59	63	68	90	116
Alloys, unwrought, including some remelted scrap thousand tons	18	18	22	17	21
Semimanufactures and crude castings do	54	56	52	48	57
Magnesium and magnesium alloys:					
Unwrought	2,168	2,912	3,288	3,187	3,141
Semimanufactures	249	279	257	373	538
Castings	23,878	26,284	30,587	31,614	38,499
Mercury 76 pound flasks	NA	NA	725	1,595	1,740
Molybdenum	88	119	127	115	208
Nickel, including powder	[r] 2,523	[r] 3,001	[r] 3,223	[r] 1,935	761
Platinum troy ounces	1,447	965	1,543	1,736	2,186
Silver:					
In ores thousand troy ounces	[r] 1,843	[r] 1,879	[r] 1,958	2,067	1,991
Smelter do	[r] 14,477	16,181	[r] 15,371	12,062	11,580
Tin and tin alloys:					
Refined unwrought long tons	1,868	2,008	2,321	2,212	2,274
Alloys, unwrought, and solder do	18,162	17,283	17,216	[r] 18,536	19,765
Semimanufactures do	362	403	342	346	394
Castings do	426	386	409	338	214
Tungsten, minimum 90 percent tungsten	555	611	550	532	649
Zinc and zinc alloys:					
Zinc in ores thousand tons	114	122	113	109	96
Metal:					
Primary do	142	141	130	105	107
Secondary do	61	62	60	68	69
Alloys do	33	31	36	39	59
Semimanufactures do	74	77	76	70	85
Castings do	29	31	35	36	45

See footnotes at end of table.

TABLE 2.—Federal Republic of Germany: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Nonmetals:					
Barite thousand tons	498	471	465	[r] 423	443
Basalt lava and lava sand do	2,785	3,378	4,112	4,968	NA
Bromine and bromine compounds	2,102	2,532	2,145	2,139	2,236
Calcite do	33	33	36	36	[e] 36
Cement:					
White portland do	18,063	19,500	20,739	21,519	24,789
Other do	6,843	7,643	7,855	7,699	9,115
Chalk do	91	88	74	72	[e] 72
Chlorine, elemental do	658	725	801	920	1,015
Clays:					
Kaolin do	344	373	383	[r] 388	[2] 457
Refractory:					
Clay-sand do	199	201	196	193	177
Other do	4,109	4,471	4,473	4,330	NA
Bleaching do	326	374	345	365	NA
Corundum, artificial do	75	74	64	58	64
Diatomite and similar siliceous earths:					
Diatomite do	46	65	61	89	99
Other do	49	50	52	51	NA
Feldspar and pegmatite do	268	270	274	269	283
Fluorine and fluorine compounds do	36	41	43	46	51
Fluorspar do	130	121	106	87	92
Graphite do	12	12	12	12	13
Gypsum and anhydrite					
Crude marketable do	955	1,012	961	1,059	1,155
Calcined do	1,006	[r] 994	[r] 988	942	1,010
Iodine and iodine compounds	176	120	132	118	119
Fertilizers, mineral:					
Phosphates:					
Superphosphate, P_2O_5 content do	68	53	52	53	68
Ground basic bessemer slag do	490	380	399	431	436
Other do	59	64	67	74	104
Potash:					
Crude salts do	18,642	19,509	18,413	18,537	20,589
K_2O content do	2,316	2,400	2,264	2,284	2,553
Marketable K_2O content do	1,979	2,044	[r] 1,938	1,948	2,201
Lime:					
Hydraulic, including burnt dolomite do	9,709	9,924	9,698	9,775	10,814
Other, ground do	1,746	1,867	2,033	2,371	NA
Limestone:					
For direct sale do	8,872	8,706	8,335	7,255	9,321
Other do	35,967	36,182	40,523	42,043	45,264
Total do	44,839	44,888	48,858	49,298	54,585
Pigments, natural mineral do	18	18	17	17	NA
Pegmatite do	60	67	66	76	NA
Pumice do	4,302	5,351	5,707	6,391	5,821
Pyrites, marketable do	537	[r] 508	[r] 386	[r] 385	424
Sulfur content do	223	217	167	177	187
Quartzite do	350	342	295	272	NA
Salt:					
Rock do	4,360	4,346	4,560	5,226	5,399
Other do	339	341	346	362	397
Sand and gravel:					
For roads and construction do	96,798	110,273	124,643	132,358	[p] 155,664
Moulding sand do	1,026	957	858	781	879
Quartz sand, ground do	238	222	603	906	904
Quartz and glass sand, natural (unground) thousand tons	3,566	3,911	4,065	3,858	4,870
Slate:					
Roofing do	66	55	50	47	[p] 37
Gravel, splitting and ground slate do	244	234	225	331	NA
Other do	[r] 59	[r] 66	[r] 64	65	88
Stone:					
Crushed do	56	63	72	79	86
Dimension thousand cubic meters	173	194	156	217	251
Sulfur, elemental thousand tons	84	84	91	86	78
Talc and soapstone do	29	30	28	[r] 26	41
Trass and tuff do	59	75	78	5	NA
Mineral fuels:					
Bituminous coal and anthracite do	142,287	142,740	141,136	142,116	142,201
Coal briquets do	5,219	4,869	5,663	6,353	5,409
Lignite do	96,138	97,194	101,251	106,658	110,927
Pitch coal do	1,783	1,763	1,760	1,841	1,869

See footnotes at end of table.

TABLE 2.—Federal Republic of Germany: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Mineral fuels:—Continued					
Coke:					
At mines……thousand tons	37,221	37,044	36,054	35,213	37,394
At steelworks……do	7,533	7,490	7,144	r 6,682	5,955
Gashouse……do	5,220	4,948	r 4,960	r 4,822	4,912
From Lignite……do	602	601	600	600	595
Peat:					
For agricultural use……do	812	523	612	770	e 960
For fuel……do	790	753	826	830	518
High temperature coal distillation products:					
Tar products……do	1,857	1,913	1,976	1,970	NA
Benzol products……do	653	630	615	571	NA
Petroleum and natural gas:					
Natural gas, dry……million cubic feet	r 15,894	r 17,084	r 21,885	r 32,482	r 51,717
Petroleum gas……do	NA	NA	6,790	9,089	12,475
Crude petroleum……thousand tons	5,530	6,204	6,776	7,383	7,673
Petroleum refinery products: [3]					
Liquefied petroleum gases thousand tons	r 776	846	853	1,102	1,380
Gasoline……do	r 5,754	6,746	7,478	8,390	9,247
Natural gasoline……do	252	520	649	916	1,304
Kerosine……do	r 51	50	r 53	r 83	62
Jet fuel……do	r 221	366	r 576	r 556	616
Diesel fuel……do	r 4,956	5,573	6,155	7,246	6,788
Lubricants……do	r 608	r 518	r 564	r 554	600
Fuel oil……do	r 13,391	r 17,407	r 19,312	r 23,046	31,694
Paraffin……do	58	70	78	97	87
Bitumen……do	r 1,176	1,387	1,804	2,304	2,821
Petroleum coke……oo	307	347	389	430	444
Refinery gas……do	857	1,001	1,200	1,470	1,880
Other……do	r 136	r 138	r 193	r 242	348
Total……do	r 28,543	34,969	39,304	r 46,436	57,271

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Includes copper in concentrates from treatment of dump material.

[2] Crude saleable and washed.

[3] Include refinery consumption.

TRADE

In step with the trend in industrial production, the value of gross exports in 1964 increased 11.3 percent over that of 1963 to $16,200 million, of which $3,600 million consisted of minerals and metals in the commodity groups shown in table 3. Significant increases were shown in the export of chemical elements and inorganic compounds, semifabricated metals, and nonmetal products.

Gross imports increased 12.6 percent to $14.7 billion of which $4.4 billion (an increase of 24 percent) consisted of the above commodity groups. The most important increases were made in the import of basic mineral raw materials required by the mineral and metal processing and manufacturing industries.

The European Economic Community (EEC) took 48 percent of West Germany's exports of minerals and metals in 1964 and was the source of 31 percent of the imports while the European Free Trade Association (EFTA) accounted for 24 percent of the exports and 16 percent of the imports. The United States received 5 percent of the exports and supplied 9 percent of the imports.

TABLE 3.—Federal Republic of Germany: Value of mineral trade by major commodity groups[1]

(Million dollars)

Commodity group	1962 total	1963 total	1964						
			Europe[2]		East Europe	Other	United States	All other	Total
			EEC	EFTA					
Exports:									
Metals:									
Ores and scrap	65.6	68.3	63.7	13.0	0.8	3.5	0.1	0.7	81.8
Iron and steel	1,245.1	1,142.5	601.0	249.1	77.1	74.8	76.8	156.4	1,235.2
Gold	5.7	12.2	4.3	7.8	.1	.3	.2	1.7	14.4
Other nonferrous metals	262.2	255.3	108.1	83.6	17.8	14.0	35.0	37.7	296.2
Nonmetals:									
Crude:									
Fertilizers	2.1	2.0	14.5	3.9	--------	.2	--------	.3	18.9
Other[3]	45.4	50.9	21.4	11.5	.7	.9	1.0	3.5	39.0
Manufactures:									
Fertilizers	133.8	144.5	21.2	30.7	5.1	23.7	5.2	52.8	138.7
Other	296.9	311.4	165.6	87.7	4.7	16.4	30.5	48.9	353.8
Chemical elements and compounds[3][4]	457.6	516.8	198.3	179.4	44.7	52.6	31.6	117.1	623.7
Mineral fuels:									
Coal, coke, and briquets	568.8	610.1	455.5	89.9	2.0	9.9	1.2	7.3	565.8
Petroleum and petroleum products	160.6	193.0	49.6	95.1	1.5	4.1	.4	53.6	204.3
Manufactured and natural gas	13.6	13.2	9.1	2.4	--------	--------	--------	--------	11.5
Mineral tar and crude chemicals from coal, petroleum, and natural gas	6.5	6.3	3.7	1.1	.1	.2	1.1	.9	7.1
Total	3,263.9	3,326.5	1,716.0	855.2	154.6	200.6	183.1	480.9	3,590.4
All other commodity groups	9,999.7	11,250.9	4,191.6	3,566.2	424.5	1,017.8	1,013.1	2,426.5	12,639.7
Grand total exports	13,263.6	14,577.4	5,907.6	4,421.4	579.1	1,218.4	1,196.2	2,907.4	16,230.1

See footnotes at end of table.

TABLE 3.—Federal Republic of Germany: Value of mineral trade by major commodity groups [1]—Continued

(Million dollars)

Commodity group	1962 total	1963 total	1964						
			Europe [2]		East Europe	Other	United States	All other	Total
			EEC	EFTA					
Imports:									
Metals:									
Ores and scrap	489.2	461.2	110.4	172.1	12.7	34.4	49.2	304.0	682.8
Iron and steel	644.0	638.1	550.6	171.6	18.9	16.5	18.7	10.4	786.7
Gold	101.4	75.2	1.5	23.4	63.9	.1	.5	6.4	95.8
Other nonferrous metals	564.6	579.1	226.2	163.1	30.2	19.1	85.6	265.7	789.9
Nonmetals:									
Crude:									
Fertilizers	25.9	26.4	.9	--------	5.0	20.0	9.7	--------	35.6
Other	129.8	139.2	42.4	46.2	8.7	18.4	13.2	31.4	160.3
Manufactures:									
Fertilizers	9.0	11.6	12.6	.2	--------	--------	.1	--------	12.9
Other	166.2	179.8	130.1	52.6	3.8	20.6	12.3	16.5	235.9
Chemical elements and compounds	194.7	234.3	100.4	41.3	15.9	7.8	104.6	13.1	283.1
Mineral fuels:									
Coal, coke and briquets	130.0	146.8	27.2	10.0	14.5	--------	73.4	--------	125.1
Petroleum and petroleum products	930.0	1,076.5	169.5	38.3	73.6	1.6	18.9	913.1	1,215.0
Manufactured and natural gas	1.2	1.6	1.5	--------	--------	--------	--------	--------	1.5
Mineral tar and crude chemicals from coal, petroleum and natural gas	9.5	7.5	3.2	.5	3.7	--------	1.1	--------	8.5
Total	3,395.5	3,577.3	1,376.5	719.3	250.9	138.5	387.3	1,560.6	4,433.1
All other commodity groups	8,883.9	9,492.0	3,721.7	1,952.1	352.1	673.5	1,629.2	1,948.1	10,276.7
Grand total imports	12,279.4	13,069.3	5,098.2	2,671.4	603.0	812.0	2,016.5	3,508.7	14,709.8

---

[1] Groups listed are those of the Standard International Trade Classification—Revised (SITC–R) as specified in the United Nations publication Statistical Papers, ser. M No. 34.

[2] Europe has been subdivided as follows: EEC—Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands: EFTA—Denmark, Norway, Portugal, Sweden, Switzerland, and the United Kingdom: East Europe—Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and the U.S.S.R.: other—Finland, Greece, Spain, Turkey, and Yugoslavia.

[3] Includes some commodities not covered elsewhere in the Minerals Yearbook.

[4] Grouping as reported is not readily divisible between metals and nonmetals.

TABLE 4.—Federal Republic of Germany: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal destinations
Metals:				
Aluminum:				
Bauxite	632	744	206	Austria 446; Italy 120.
Alumina thousand tons	66	72	3	NA.
Aluminum hydroxide do	29	29	13	Netherlands 7; Belgium-Luxembourg 6; Sweden 5; Austria 4; Argentina 3.
Scrap	1,475	1,451	1,448	Italy 1,113.
Aluminum and alloys, unwrought	6,025	14,185	5,189	Netherlands 3,117; United States 2,941; Rumania 2,569; Switzerland 1,334.
Semimanufactures:				
Plates, sheets and strip	22,428	27,251	8,894	Switzerland 11,633; Belgium-Luxembourg 5,074; United States 2,531; Netherlands 2,017.
Other	23,575	27,537	9,993	France 4,038; United States 3,635; Netherlands 3,231; Sweden 1,569; Italy 1,490; Belgium-Luxembourg 1,232; Denmark 1,187; Austria 1,019.
Antimony metal, all forms	1,030	781	743	Italy 301; France 273.
Arsenic oxides and acids	68	56	7	NA.
Beryllium metal, all forms [1]	NA	NA	NA	
Bismuth metal, all forms	139	115	38	United Kingdom 63; Netherlands 20; France 12.
Cadium:				
Oxide and hydroxide kilograms	32,500	18,500	13,100	Netherlands 8,600; Italy 4,500; India 1,300; Rumania 1,000.
Metal, unwrought or semimanufactures. do	64,100	48,600	22,800	Netherlands 11,300; France 6,500; India 5,700.
Chromium:				
Ores and concentrates (chromite)	791	1,469	1,142	France 535; Belgium-Luxembourg 311; Netherlands 228.
Chromium oxides and hydroxide	4,617	4,791	NA	NA.
Metal, unwrought or semimanufactures.	48	55	17	India 15; Austria 13; Italy 12.
Cobalt:				
Oxides and hydroxide	19	30	11	Bulgaria 8; Italy 6; France 4 Yugoslavia 3.
Metal, all forms	1,018	886	45	United States 630; Japan 96; Canada 42; Netherlands 34; Spain 33 Finland 25.
Copper:				
Matte	10	--------	--------	
Blister	91	255	229	Italy 120.
Scrap thousand tons	15	21	16	Italy 5; Netherlands 4; Belgium-Luxembourg 4; Japan 3.
Refined copper and copper alloys unwrought. do	118	74	12	Austria 15; U.S.S.R. 10; Czechoslovakia 7; United Kingdom 6; France 6; Hungary 5.
Semimanufactures:				
Bars, rods, and wire	27,531	30,746	7,871	Poland 7,533; Netherlands 4,903; United States 3,839; Switzerland 3,384.
Plates, sheets, and strip	10,925	10,202	3,854	Netherlands 2,491; United States 2,350; Austria 1,089; Italy 684 Switzerland 592.
Tubes, pipes, and fittings	23,772	29,126	7,158	United States 13,702; Netherlands 4,380.
Other	2,265	2,717	925	United States 524; Italy 360; France 333 U.S.S.R. 175; Netherlands 167; Sweden 155 Switzerland 153.
Gold and gold alloys:				
Unwrought troy ounces	156,703	203,707	36,170	Chile 60,701; Switzerland 47,905; Portugal 24,885; Italy 18,262; Netherlands 17,136.
Semimanufactures do	50,541	87,450	11,349	Austria 41,764; Denmark 10,481: Switzerland 8,391.
Coin do	1,254	3,022	--------	Switzerland 2,154.

See footnotes at end of table.

TABLE 4.—Federal Republic of Germany: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal destinations
Metals—Continued				
Iron and steel:				
Ores, concentrates, and other iron bearing raw materials:				
Roasted pyrites..thousand tons	5	3	3	All to Belgium-Luxembourg.
Other iron ores..........do	282	286	13	Austria 271; France 8.
Slags, ashes and residues..do	1,187	1,262	1,248	Netherlands 793; France 393 Belgium-Luxembourg 61.
Scrap	1,207	1,299	1,249	Italy 1,103; France 121; Austria 35.
Spiegeleisen	17	18	16	Belgium-Luxembourg 13; France 2.
Pig iron	897	810	503	Italy 327; Belgium-Luxembourg 114; Japan 103; United States 77 France 60.
Shot, powder and sponge. thousand tons	8	7	3	Switzerland 1; Belgium-Luxembourg 1; Austria 1; Netherlands 1.
Ferroalloys:				
Ferromanganese..........do	31	67	11	United States 46; Italy 6; France 3.
Other..........do	13	11	3	Switzerland 2; Italy 1; Belgium-Luxembourg 1; Rep. of South Africa 1; Austria 1.
Steel (including special and alloy):				
Crude ingots and other primary forms. do	1,081	1,131	724	France 435; Switzerland 215; Italy 177; Belgium-Luxembourg 76.
Coils for rerolling..........do	267	331	297	Italy 186; France 101; Spain 26.
Wire rod..........do	376	446	214	France 93; United States 74; Italy 41; Netherlands 40; Belgium-Luxembourg 39.
Other bars and rods..........do	1,116	1,156	685	France 386; Netherlands 190; United States 75; Italy 73; Switzerland 60;
Angles, shapes and sections..do	1,084	1,021	507	France 201; Netherlands 166; Italy 123; Switzerland 74; Spain 74.
Plates and sheets:				
Universal plates..........do	89	65	40	France 25; Switzerland 7; Netherlands 7.
Other heavy plates (+4.75 mm thick). do	1,115	1,051	598	France 264; Italy 171; Netherlands 118; Switzerland 95.
Medium and thin plates, and sheets. do	610	695	312	France 136; Italy 111; U.S.S.R. 64; Netherlands 44; Denmark 34; Sweden 33.
Electric sheets..........do	66	79	40	Italy 15; France 14; U.S.S.R. 10; Netherlands 8; Switzerland 6.
Coated or surface treated:				
Tinplate..........do	100	107	43	France 20; Italy 13; Spain 11; Netherlands 10; Switzerland 8; Cuba 6; Denmark 6.
Other..........do	88	79	38	Italy 24; Switzerland 9; France 7; Sweden 6; Denmark 6; Netherlands 5.
Hoop and strip..........do	389	373	182	France 90; Netherlands 61; Italy 26; Switzerland 23; Greece 22; Denmark 15; United States 13.
Railway track material..........do	231	184	99	Italy 60; Netherlands 36; Switzerland 25; Denmark 6.
Wire, bare including plated..do	176	173	56	France 33; United States 28; Netherlands 15; Switzerland 11; Iran 6; Denmark 6; Canada 5.
Tubes, pipes, and fittings..........do	1,307	970	232	United States 117; Netherlands 104; U.S.S.R. 91; Switzerland 73; France 71; Sweden 56; Italy 43; Austria 39; Libya 35; Denmark 34.
Crude castings and forgings..do	13	13	4	Switzerland 6; Netherlands 2.
Lead:				
Ores and concentrates	5	10,215	10,215	All to France.
Scrap	5,147	8,829	8,809	Italy 5,406; Netherlands 2,886.
Lead oxides	7,971	8,171	3,875	Netherlands 2,041; United States 661; Italy 478; Denmark 377; Sweden 359; Norway 354.
Metal, unwrought	22,834	17,968	10,742	France 4,483; Belgium-Luxembourg 3,144; Netherlands 2,946; United States 1,957; Austria 1,382.
Semimanufactures	3,320	2,997	571	Sweden 409; Finland 378; Switzerland 362; Belgium-Luxembourg 256; Austria 208; Denmark 176.

TABLE 4.—Federal Republic of Germany: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal destinations
Metals—Continued				
Magnesium:				
Oxide and hydroxide	1,121	1,599	492	Italy 294; Mexico 182; United Kingdom 135; Poland 132; Czechoslovakia 126; Austria 121.
Metal, all forms	202	508	344	Italy 170; United States 115; Netherlands 91.
Manganese:				
Ores and concentrates	5,999	6,705	2,189	Italy 946; Turkey 917; Sweden 854; Netherlands 533; Austria 525.
Manganese oxides	110	84	17	Czechoslovakia 10.
Mercury:				
Oxides and hydroxide kilograms	1,500	3,400	1,600	Italy 1,600; Indonesia 600.
Metal 76-pound flasks	1,033	763	339	Netherlands 278; Portugal 114; Italy 55; Austria 46.
Molybdenum metal, all forms. kilograms	22,700	36,000	12,900	France 10,300; Sweden 9,800; United States 4,300; U.S.S.R. 2.500.
Nickel:				
Scrap	673	677	527	France 369; Netherlands 148.
Unwrought metal, including nickel anodes.	402	407	170	Bulgaria 59; Netherlands 50; Belgium-Luxembourg 43; Italy 41; Rep. of South Africa 40.
Semimanufactures	4,964	4,133	1,335	United Kingdom 1,383; Netherlands 663 Italy 290; France 275; Austria 196.
Platinum-group metals and alloys, unwrought and semimanufactures. troy ounces	123,041	121,147	36,473	Switzerland 22,930; Hong Kong 17,716; Italy 17,061; Sweden 12,919; Netherlands 10,818.
Radioactive and associated materials:				
Radioactive elements and compounds. kilograms	1,068	357	11	Austria 299; Sweden 40; Belgium-Luxembourg 10.
Stable isotopes and their compounds. do	5	13	6	NA.
Uranium, thorium and rare earth mixtures and compounds.	17	13	9	Netherlands 5; Italy 3; United States 1.
Silicon	6	62	56	France 56.
Silicon carbide	7,835	6,720	NA	NA.
Silver and silver alloys:				
Scrap and residues kilograms	8	1,704	6	NA.
Unwrought thousand troy ounces	19,502	21,873	11,607	Italy 6,071; Austria 4,766; Belgium-Luxembourg 3,108; Switzerland 2,828; France 2,225; Czechoslovakia 1,427.
Semimanufactures do	4,904	5,045	1,538	Switzerland 1,028; Sweden 912; Netherlands 616; Italy 510; Denmark 505; Norway 325.
Tantalum, unwrought or semimanufactures. kilograms	11,300	6,000	1,100	Austria 1,500; United States 1,200; Japan 1,000; Switzerland 700.
Tin:				
Oxides long tons	154	244	63	Netherlands 36; Czechoslovakia 30; Poland 29; Spain 26; Brazil 26; Italy 21.
Scrap do	3	112	112	Netherlands 110.
Unwrought do	1,651	1,365	697	France 515; Austria 124; Netherlands 101; Czechoslovakia 100.
Semimanufactures do	64	108	38	Italy 33; Sweden 11; South Viet-Nam 10; Netherlands 7; Denmark 7.
Titanium oxide	50,612	54,143	18,641	Sweden 7,189; Netherlands 5,842; Italy 5,410; France 3,853; Austria 3,270; Switzerland 2,632; Norway 2,581; United Kingdom 2,454; Denmark 2,190; United States 1,901.
Tungsten:				
Ores and concentrates	116	91	-------	United Kingdom 71; Japan 20.
Metal, unwrought, or semimanufactures.	221	252	15	United States 137; Sweden 50; Switzerland 26; Austria 12.

See footnotes at end of table.

TABLE 4.—Federal Republic of Germany: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal destinations
Metals—Continued				
Vanadium metal, all forms..kilograms..	(2)	700	(2)	NA.
Zinc:				
Ores and concentrates	12,941	33,097	20,563	Belgium-Luxembourg 17,389; United Kingdom 12,534; Netherlands 3,174.
Zinc oxide	7,077	7,726	949	Sweden 1,011; Turkey 792; Switzerland 711; Denmark 694; United States 581; Austria 436.
Scrap	2,068	3,231	3,216	Italy 2,392; France 517.
Zinc dust	2,034	1,740	374	Czechoslovakia 677; Austria 210; Switzerland 181.
Unwrought metal	25,392	29,870	7,057	United States 9,174; Switzerland 2,576; Philippines 2,509; Sweden 2,255; France 2,018.
Semimanufactures:				
Plates, sheets and strip	3,665	4,494	989	Denmark 720; Netherlands 595 Turkey 343; Sweden 336; France 329; Switzerland 291.
Other	1,040	1,162	NA	NA.
Zirconium, unwrought or semimanufactures. kilograms..	2,100	6,900	--------	Sweden 5,600; United States 600; Czechoslovakia 500.
Other base metals and base metal raw materials and compounds, not elsewhere specified:				
Nonferrous ores and concentrates	36,305	848	152	Switzerland 330; Czechoslovakia 158; Austria 154.
Ashes and residues containing nonferrous metals	61,210	58,640	48,361	Beligum-Luxembourg 27,646; Netherlands 17,109; United Kingdom 4,414.
Oxides and hydroxides:				
Barium, magnesium, and strontium.	810	895	506	Belgium-Luxembourg 295; Italy 176; U.S.S.R. 120; United Kingdom 100.
Nickel, molybdenum, vanadium, and tungsten.	1,339	1,387	405	Japan 419; Austria 372; Beligum-Luxembourg 173; Italy 123.
Other	1,620	2,659	1,274	Italy 627; United States 509; France 330; Netherlands 235.
Metals, unwrought and semimanufactures: Not elsewhere specified:				
Arsenic and tellurium	5	3	2	France 1; Italy 1.
Columbium and titanium	18	28	24	France 19; Italy 3; Sweden 2.
Selenium and phosphorous	2,845	2,958	NA	NA.
Other base metals	11	9	3	United States 3; Italy 3.
Other base metal oxides, not elsewhere specified.	1,620	2,659	1,274	Italy 627; United States 509; France 330; Netherlands 235.
Nonmetals:				
Asbestos:				
Crude, washed or ground	370	298	43	Austria 133; Switzerland 57.
Asbestos or cellulose fiber cement	22,619	50,239	19,085	Netherlands 10,936; France 7,446; Yugoslavia 6,148; United States 5,932; Austria 5,890; Sweden 5,006.
Fabricated asbestos (excluding friction materials).	2,432	2,227	839	Italy 396; Netherlands 292; Switzerland 232; Denmark 180.
Barite and witherite natural. thousand tons..	100	104	88	France 58; Belgium-Luxembourg 16; Netherlands 14; United Kingdom 5; Austria 3.
Barium sulfate, precipitated.....do....	19	19	5	United Kingdom 4; Belgium-Luxembourg 2; Sweden 2; Switzerland 2.
Boron salts:				
Natural	--------	1	--------	NA.
Oxide and acid	62	61	5	Yugoslavia 20.
Bromine and fluorine	329	116	62	Switzerland 47; Netherlands 44.
Cement, hydraulic.....thousand tons..	905	783	601	Netherlands 421; France 228; Switzerland 37.
Cement products.....do....	119	145	129	Belgium-Luxembourg 71; France 42.
Chalk	421	776	77	Denmark 468.
Chlorine	237	169	--------	Iraq 75; Saudi Arabia 62.

See footnotes at end of table.

TABLE 4.—Federal Republic of Germany: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal destinations
Metals—Continued				
Clays and refractories, not elsewhere specified:				
China clay (kaolin) thousand tons	38	52	31	Italy 17; Switzerland 8; Finland Netherlands 6; France 6.
Fire clay do	346	366	273	Netherlands 82; Italy 75; Belgium-Luxembourg 63; France 53; Switzerland 44; Austria 36.
Other clays [3] do	467	418	381	Netherlands 210; France 68; Belgium-Luxembourg 63.
Refractory and heat insulating products not elsewhere specified:				
Slag and rock wool. thousand tons	8,289	10,958	4,297	Switzerland 1,843; Italy 1,544; Belgium-Luxembourg 1,297; Sweden 1,078.
Heat insulating bricks	3,394	3,119	1,939	Italy 905; France 404; Belgium-Luxembourg 349; Switzerland 340.
Other refractory bricks, not elsewhere specified. thousand tons	193	171	103	France 42; Italy 29; Belgium-Luxembourg 22; Austria 13; Switzerland 11; Netherlands 10.
Refractory cement and mortar. do	107	113	80	Italy 36; France 26; Belgium-Luxembourg 11; Austria 9.
Nonrefractory construction materials:				
Brick and roofing tile do	29	27	17	Belgium-Luxembourg 8. ; Netherlands 7; Sweden 3.
Other do	181	194	124	France 80; Netherlands 26; Switzerland 18.
Corundum, artificial	18,499	17,304	5,244	Switzerland 2,461; Austria 2,123. France 1,944; Italy 1,751; United States 1,666; Sweden 1,334; Nethlands 1,174; United Kingdom 1,126.
Diamonds:				
Dust and powder of diamonds and other gem stones. carats	18,825	32,430	24,590	Netherlands 10,820; France 5,585; Italy 4,675; Belgium-Luxembourg 4,050; Israel 2,030.
Industrial diamonds do	60,000	45,000	30,000	Netherlands 15,000; France 10,000; Belgium-Luxembourg 5,000; Austria 5,000; United Kingdom 5,000.
Gem diamonds, rough or simply cut. do	25,000	130,000	NA	NA.
Gem diamonds, otherwise worked. do	180,000	160,000	95,000	Belgium-Luxembourg 80,000; United States 50,000; Netherlands 10,000; United Kingdom 10,000.
Diatomite, crude or calcined	3,807	3,639	1,503	Belgium-Luxembourg 576; Netherlands 415; Switzerland 371; Italy 368; Sweden 309.
Dolomite thousand tons	85	58	50	Netherlands 36.
Feldspar	14,355	11,948	11,383	Netherlands 3,916; Belgium-Luxembourg 2,748; Italy 2,748.
Fluorspar	14,335	11,598	2,173	Austria 6,344; Netherlands 1,663 Switzerland 1,475.
Gem stones, except diamonds and pearls:				
Natural:				
Rough or simply worked. kilograms	49,894	41,728	22,063	France 17,172; United Kingdom 6,432; Italy 3,791; mainland China 3,717.
Otherwise worked do	19,541	21,930	5,647	United States 7,273; Italy 2,628; France 2,246; Senegal 1,415; United Kingdom 1,120.
Synthetic and reconstructed stones, rough or worked. do	5,242	6,358	307	United States 2,358; Pakistan 1,589; Switzerland 577; India 266.
Graphite	6,635	6,558	2,030	Italy 1,432; United States 1,311; United Kingdom 459; France 374; Hungary 309; Finland 271; Switzerland 240; Spain 202.

See footnotes at end of table.

TABLE 4.—Federal Republic of Germany: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal destinations
Metals—Continued				
Gypsum and anhydrite. thousand tons	187	190	138	Netherlands 96; Belgium-Luxembourg 27; Sweden 18.
Gypsum products do	6	7	4	France 3; Switzerland 2.
Iodine kilograms	19,800	17,300	5,200	Netherlands 2,500; Italy 2,400; Venezuela 1,800; Pakistan 1,300.
Lime thousand tons	283	292	266	Netherlands 234; Switzerland 21; Belgium-Luxembourg 18; France 14.
Limestone do	27	37	31	Netherlands 27.
Magnesite:				
Crude, sintered or calcined	2,524	3,920	3,380	Switzerland 1,466; France 1,349.
Dolomite, magnesite and chrome-magnesite refractories.	39,930	38,360	20,343	France 7,065; Sweden 6,830; Belgium-Luxembourg 6,608; Italy 4,493.
Mica:				
Crude, splittings and scrap	429	486	46	Switzerland 244; Sweden 76; Austria 63.
Fabricated mica products	100	85	24	Denmark 15; Italy 10; Sweden 9 Netherlands 9; Finland 8.
Phosphates:				
Phosphate rock	33,543	36,225	20	Austria 34,405; Switzerland 1,750.
Phosphatic slag (basic Bessemer). thousand tons	366	408	329	France 312; Austria 34; Chile 16.
Superphosphate, P_2O_5	4,189	4,190	676	Denmark 1,597; Brazil 522; Italy 450; Philippines 326.
Other phosphate fertilizers, P_2O_5 content.	6,165	2,622	--------	All to Chile.
Pigments, not elsewhere specified:				
Earth colors, natural	2,909	2,556	1,236	Switzerland 484; Belgium-Luxembourg 434; Sweden 359; Netherlands 335; France 324.
Iron oxide and hydroxide	54,493	65,897	27,588	France 12,807; United Kingdom 7,019; Belgium-Luxembourg 6,195; Netherlands 4,992; Sweden 4,114; Italy 3,594; Denmark 1,919; Austria 1,420; Switzerland 1,221; Spain 1,097.
Potash salts:				
Crude thousand tons	84	73	50	Netherlands 25; Belgium-Luxembourg 24; United Kindom 23.
Potassium sulfate, potassium chloride, and potassium-magnesium chloride. do	1,281	1,458	293	United Kingdom 182; United States 181; Netherlands 144; Denmark 135; Japan 97; Belgium-Luxembourg 91; Austria 65; Sweden 48; Australia 48.
Pumice thousand tons	633	706	701	Netherlands 478; Belgium-Luxembourg 210: France 14.
Quartz and quartzite do	45	43	22	Italy 13; Austria 11: Switzerland 6.
Sand, natural, except metal bearing. do	925	1,125	846	Netherlands 679; Switzerland 191; Belgium-Luxembourg 90; Austria 78.
Slate:				
Crude, or rough split do	20	40	31	Netherlands 29; Sweden 6.
Products	588	746	609	Netherlands 352.
Stone:				
Marble and other calcareous do	9	11	10	Belgium-Luxembourg 9; Netherlands 1.
Sandstone do	125	60	60	Netherlands 58.
Other dimension stone	138	230	229	Netherlands 226.
Gravel and crushed stone do	454	617	525	Netherlands 393; Belgium Luxembourg 127; Switzerland 88
Shaped paving stone, monumental stone, etc. do	41	29	25	Switzerland 17; Belgium-Luxembourg 7.
Sulfur, elemental	21,703	24,322	1,209	United Arab Republic (Egypt) 6,674; Denmark 3,071; Austria 2,815; Indonesia 1.817.
Talc and soapstone	1,058	1,206	169	Sweden 329; Switzerland 251; Denmark 186.

TABLE 4.—Federal Republic of Germany: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal destinations
Mineral fuels:				
Coal, anthracite and bituminous. thousand tons..	17,909	16,352	14,107	France 6,164; Netherlands 3,992; Belgium-Luxembourg 2,809; Italy 1,142; Austria 949; Switzerland 800; Denmark 181; Ireland 114.
Briquets, anthracite, and bituminous. do....	363	455	405	Netherlands 170; Italy 106.
Lignite and lignite briquets [4] ....do....	1,674	1,717	1,303	France 475; Netherlands 420; Belgium-Luxembourg 246; Austria 208; Switzerland 206; Italy 162.
Peat and peat briquets..........do....	154	148	82	Netherlands 62; United States 32; Switzerland 23.
Coke..........do....	10,319	12,076	8,802	France 4,547; Belgium-Luxembourg 3,361; Sweden 895; Denmark 782; Switzerland 521; Austria 480.
Coal tar..........do....	65	63	57	France 32; Netherlands 21.
Petroleum and petroleum products:				
Gasoline..........thousand tons..	1,387	1,300	140	Switzerland 457; United Kingdom 267; Sweden 214; Denmark 106.
Kerosine..........do....	345	498	88	Ship bunkers 231; United Kingdom 135; Netherlands 88; Denmark 32.
Distillate fuels..........do....	933	1,353	194	Switzerland 680; Denmark 205; Netherlands 123; Bunkers 206.
Residual fuel oils..........do....	2,031	2,772	992	Netherlands 735; Switzerland 585; United Kingdom 210; Belgium-Luxembourg 172; Bunkers 849.
Lubricants..........do....	85	99	38	Netherlands 26; United Kingdom 11; Austria 11; Belgium-Luxembourg 10; Switzerland 7; plane and ship requirements 10.
Mineral waxes..........do....	39	42	10	Netherlands 7; Sweden 7; Finland 4; Austria 3; Denmark 3.
Pitch and pitch coke..........do....	202	199	139	France 111; Belgium-Luxembourg 26; Austria 16; Switzerland 11; Cameroon 10; Spain 8; Norway 7.
Petroleum coke..........do....	103	144	61	France 54; Switzerland 40; Cameroon 21; Spain 8; Austria 7.
Bitumins and asphalt..........do....	154	178	61	Switzerland 58; Denmark 50; Netherlands 39; Belgium-Luxembourg 19.
Other petroleum products, not elsewhere specified. [5] do....	32	30	4	Denmark 6; Rep. of South Africa 3; Switzerland 2.
Natural and liquid petroleum gases. do....	228	222	153	Belgium-Luxembourg 82; Denmark 62; Netherlands 58; France 13.
Manufactured gas. thousand cubic meters..	242,258	265,428	261,919	France 223,147; Austria 2,228; Switzerland 1,281.

NA Not available.

[1] Exports of beryllium metal in 1963 were valued at 115,000 DM or $28,750 of which 61 percent was to EEC countries.

[2] Less than 50 kilograms.

[3] Includes andalusite and dinas clays.

[4] Includes pitch coal: 1962—6,400 tons; 1963—6,000 tons all to Austria.

[5] Includes vaseline, some nonlubricating oils and preparations.

TABLE 5.—Federal Republic of Germany: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal sources
Metals:				
Aluminum:				
Bauxite thousand tons	1,391	1,508	151	Yugoslavia 737; Greece 346; France 148; Hungary 91.
Alumina and aluminum hydroxide. do	36	51	--------	Rep. of Guinea 49.
Scrap do	42	44	14	United States 20; Netherlands 6; France 5.
Aluminum and alloys, unwrought. do	118	121	5	Norway 30; Canada 26; United States 20; Switzerland 11; France 4.
Semimanufactures do	13	18	14	Belgium-Luxembourg 8; Netherlands 3; France 3.
Antimony:				
Ores and concentrates	1,649	2,165	--------	Turkey 1,477; mainland China 284; Thailand 265.
Metal, all forms	3,602	4,782	22	Mainland China 2,649; U.S.S.R. 932; Czechoslovakia 923; Hungary 162.
Arsenic oxides and acids	2,230	1,825	1,600	Belgium-Luxembourg 1,114; France 486; U.S.S.R. 225.
Bismuth, unwrought or semimanufactured.	280	254	134	Netherlands 80; Belgium-Luxembourg 53; United Kingdom 42; mainland China 32; Yugoslavia 22.
Cadmium:				
Oxide and hydroxide	55	63	55	Belgium-Luxembourg 56; United States 7.
Unwrought or semimanufactured	918	1,003	435	Belgium-Luxembourg 331; U.S.S.R. 235; United States 150; Netherlands 101.
Chromium:				
Chromite thousand tons	228	174	--------	Rep. of South Africa 71; U.S.S.R. 58; Turkey 28; Iran 13.
Chrome oxides and hydroxide	74	97	80	France 76; Poland 15.
Unwrought or semimanufactured	39	75	52	France 52; United Kingdom 18.
Cobalt:				
Oxides and hydroxide	214	215	187	Belgium-Luxembourg 187; United Kingdom 28.
Unwrought or semimanufactured	580	466	345	Belgium-Luxembourg 280; United States 61; France 39; United Kingdom 29; Netherlands 27.
Copper:				
Ores and concentrates. thousand tons	134	159	--------	Cyprus 91; Chile 36.
Matte do	7	2	--------	Norway 1.
Blister do	101	122	1	Fed. of Rhodesia and Nyasaland 47; Chile 32; Peru 18.
Scrap do	27	37	19	Netherlands 7; France 4; Denmark 4; United Kingdom 2; Belgium-Luxembourg 2; Norway 1; Switzerland 1.
Refined, unalloyed do	301	255	51	Chile 77; United States 57; Belgium-Luxembourg 49; Fed. of Rhodesia and Nyasaland 36.
Alloys (including master alloys). do	36	39	13	United Kingdom 12; France 6; Argentina 6; Netherlands 5.
Semimanufactures	20,106	26,496	20,226	Belgium-Luxembourg 5,115; Sweden 3,525; Netherlands 3,196; France 1,757; United Kingdom 1,301.
Gold and gold alloys:				
Residues and scrap. thousand troy ounces	469	289	19	United States 135; Sweden 42; Denmark 39.
Unwrought do	3,032	2,174	81	U.S.S.R. 1,287; Switzerland 423; United Kingdom 210; Rep. of South Africa 136; France 45; Netherlands 25; United States 21.
Semimanufactures do	9	13	--------	United States 9; Austria 4.
Coin do	253	83	1	Austria 46; Switzerland 34.

TABLE 5.—Federal Republic of Germany: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal sources
Metals—Continued				
Iron and steel:				
Ores, concentrates and other raw materials:				
Roasted pyrites..thousand tons..	1,864	1,915	675	Spain 554; France 221; Italy 197.
Other iron ores..........do....	29,069	27,000	6,810	Sweden 7,967; France 6,802; Brazil 2,587; Liberia 1,655; Peru 1,368; Venezuela 1,070.
Blast furnace dust.......do....	181	264	264	All from France.
Iron and steel slags and residues. do....	1,726	1,976	1,505	Belgium-Luxembourg 987; France 429; United Kingdom 320; Netherlands 87; Austria 83.
Scrap:				
Tinned..................do....	43	43	NA	NA.
Other...................do....	578	595	450	Netherlands 208; United Kingdom 102; France 35.
Spiegeleisen..................do....	15	14	14	France 12; Belgium-Luxembourg 2.
Other pig iron................do....	596	465	70	Spain 94; Finland 67; U.S.S.R. 64; Rep. of South Africa 56; United Kingdom 45; Netherlands 41; Norway 33.
Shot, powder and sponge....do....	13	14	3	Sweden 7; United Kingdom 3; France 2.
Ferroalloys:				
Ferromanganese..........do....	80	71	40	France 36; Norway 12; Rep. of South Africa 10.
Other...................do....	129	140	25	Norway 66; France 21; Yugoslavia 12; Switzerland 10; Rep. of South Africa 8.
Steel (including special and alloy):				
Ingots and other primary forms. thousand tons..	242	232	196	Belgium-Luxembourg 168; France 25; United Kingdom 10; Rumania 8.
Coils for rerolling........do....	539	463	51	Austria 316; U.S.S.R. 54; United Kingdom 16; Japan 14; United States 9.
Wire rod.................do....	462	481	439	France 218; Belgium-Luxembourg 188; Netherlands 33; Sweden 23.
Other bars and rods......do....	517	580	497	Belgium-Luxembourg 324; France 129.
Angles, shapes, and sections. do....	357	399	335	Belgium-Luxembourg 205; France 120.
Plates and sheets:				
Universal plates......do....	17	16	9	France 6; Norway 4; Belgium-Luxembourg 3.
Other heavy plate (plus 4.75 mm). do....	317	290	139	Belgium-Luxembourg 77; Austria 51; France 45; Sweden 41; Czechoslovakia 21.
Medium plates......do....	127	161	120	Belgium-Luxembourg 61; France 50; Japan 17; United Kingdom 9; Austria 9; Netherlands 8.
Thin plates and sheets. do....	1,047	1,056	892	France 457; Belgium-Luxembourg 310; Netherlands 102; United Kingdom 61; Austria 44; United States 37.
Electric sheets.......do....	5	23	18	France 16.
Coated or surface treated:				
Tin plate..thousand tons..	129	107	98	France 52; Belgium 41; United Kingdom 9.
Other...........do....	63	70	54	Belgium-Luxembourg 30; France 24; Austria 8.
Hoop and strip..........do....	242	270	241	Belgium-Luxembourg 147; France 55; Netherlands 39.
Railway track material. .do....	4	10	6	Belgium-Luxembourg 3; Sweden 2.
Wire, bare including plated. do....	34	49	36	Belgium-Luxembourg 32; France 5; Sweden 4.
Tubes, pipes and fittings.[1] do....	121	130	94	Belgium-Luxembourg 37; Netherlands 35; France 17; Sweden 16.
Crude castings and forgings, iron and steel. do....			1	(2).

See footnotes at end of table.

TABLE 5.—Federal Republic of Germany: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal sources
Metals—Continued				
Lead:				
Ores and concentrates	144,748	101,198	448	Sweden 31,418; Peru 30,525; Canada 7,737.
Scrap	1,285	1,246	987	Netherlands 616; Liberia 241.
Lead oxides	4,377	3,215	634	Mexico 1,118; Poland 769; France 422; United Kingdom 336.
Unwrought	99,961	100,563	28,474	United Kingdom 28,561; Australia 18,327; France 13,902; Peru 11,120; Belgium-Luxembourg 8,791.
Semimanufactures	1,233	1,844	1,438	Belgium-Luxembourg 898; France 420; Yugoslavia 370.
Magnesium:				
Unwrought, including scrap	30,011	31,018	3,028	Norway 15,147; United States 10,522; Italy 3,001; Canada 1,268; United Kingdom 992.
Semimanufactures	126	159	23	Austria 89; United States 46.
Manganese:				
Ores and concentrates, all types. thousand tons	518	731	1	Rep. of South Africa 237; India 103; Gabon 73; U.S.S.R. 72; Ghana 58; Brazil 32; Ivory Coast 29; Hungary 27.
Oxides	1,116	1,319	12	Japan 1,177; Austria 120.
Mercury:				
Oxides and hydroxide kilograms	52,700	66,600	5,600	Yugoslavia 38,800; Spain 22,200; Netherlands 5,600.
Metal 76-pound flasks	23,552	16,332	11,220	Italy 11,188; Spain 2,506; Mainland China 1,227; Yugoslavia 435; Mexico 325.
Molybdenum, metal all forms. kilograms	89,000	64,600	25,000	Netherlands 23,100; Austria 20,500; United States 16,600; United Kingdom 2,400; Belgium-Luxembourg 1,600.
Nickel:				
Ores and concentrates	20	693	--------	All from Greece.
Matte and speiss	488	1,260	569	France 569; Canada 496; United Kingdom 148; Rep. of South Africa 47.
Scrap	3,818	4,325	1,286	United States 1,682; Netherlands 688; France 591; Austria 183; Argentina 142; Switzerland 124; Hungary 123.
Metal, unwrought	18,909	19,217	517	United Kingdom 6,363; Norway 4,976; Canada 4,780; United States 1,785; Finland 763; France 466.
Anodes for plating	353	392	201	France 129; Switzerland 78; Netherlands 54; United Kingdom 45; Norway 43.
Semimanufactures	867	516	91	United Kingdom 148; United States 122; Switzerland 85; France 67; Canada 34; Sweden 33.
Platinum-group metals:				
Platinum and silver ores	3,457	2,402	--------	All from Peru.
Waste and scrap troy ounces	61,441	389,024	90,022	Austria 225,055; Italy 77,162; Switzerland 32,151; Sweden 28,936.
Unwrought or semimanufactures. do	215,803	325,349	24,337	U.S.S.R. 163,916; United Kingdom 100,150.
Radioactive and associated materials:				
Uranium and thorium ores and concentrates.	49	26	--------	Canada 6.
Mixtures and isotopes kilograms	4,854	4,587	10	United States 4,577; France 10.
Stable isotopes and their compounds. do	2,262	65,078	--------	United States 65,064.
Uranium, thorium and rare earth mixtures.	852	735	14	India 450; Brazil 100; Austria 90.
Silicon	12,442	12,704	6,230	Italy 3,300; France 2,925; Sweden 2,549.
Silicon carbide	4,098	4,495	957	Norway 2,543; Italy 879.

TABLE 5.—Federal Republic of Germany: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal sources
Metals—Continued				
Silver and silver alloys:				
Waste and scrap. thousand troy ounces	6,480	8,272	1,511	Switzerland 2,192; Austria 1,373; Norway 1,283; Sweden 1,050; Netherlands 1,004; Italy 400; Argentina 346.
Unwrought do	40,462	40,895	6,220	Mexico 17,887; Peru 4,897; Belgium-Luxembourg 4,824; Yugoslavia 2,670; United States 2,451; United Kingdom 1,729; Sweden 701.
Semimanufactures do	513	736	36	Switzerland 622; United States 56; France 36.
Tantalum, unwrought or semimanufactures. kilograms	6,200	3,000	2,000	France 1,800; United States 800; United Kingdom 200.
Tellurium (included with arsenic)				
Tin:				
Ores and concentrates long tons	7,977	8,365	-------	All from Bolivia.
Oxides do	202	219	174	Belgium-Luxembourg 106; France 68; United Kingdom 44.
Scrap do	225	358	245	Netherlands 227; Switzerland 32; Austria 27; Yugoslavia 20.
Unwrought do	12,084	11,597	4,024	Malaya 4,562; Netherlands 3,038; mainland China 990; Belgium-Luxembourg 982; Singapore 749; United Kingdom 679; Indonesia 335.
Semimanufactures do	28	21	4	United Kingdom 13.
Titanium oxide	602	1,099	993	Netherlands 533; Italy 281; France 276.
Tungsten:				
Ores and concentrates	4,756	3,975	25	U.S.S.R. 1,720; Bolivia 631; Argentina 627; mainland China 363; South Korea 287; Austria 210.
Unwrought or semimanufactured	124	80	40	France 32; Switzerland 22; United States 9; Netherlands 7; Austria 6.
Zinc and zinc alloys:				
Ores and concentrates	133,604	124,648	6,728	Sweden 40,993; Finland 13,957; Peru 12,180; Australia 9,127; Canada 8,430; Greece 8,029; Spain 6,229.
Zinc oxides	2,712	3,031	1,938	France 996; Belgium-Luxembourg 477; Netherlands 374; Poland 300; Sweden 204; United Kingdom 189.
Scrap	865	792	546	Netherlands 315; Belgium-Luxembourg 231.
Zinc dust	2,302	3,763	2,384	Belgium-Luxembourg 2,365; Yugoslavia 555; United Kingdom 368.
Unwrought	128,611	136,109	65,519	Belgium-Luxembourg 44,144; Netherlands 14,322; Canada 13,217; Norway 9,768; Australia 9,274; Rep. of the Congo (Léopoldville) 7,902; Spain 7,255; U.S.S.R. 7,198.
Semimanufactures:				
Plates, sheets and strip	9,811	10,897	6,618	Belgium-Luxembourg 4,421; Yugoslavia 4,481.
Other	236	372	310	France 293; Norway 30.
Zirconium, unwrought or semimanufactures. kilograms	13,100	13,000	1,100	United States 9,200; United Kingdom 1,900; France 900; Japan 700.
Other base metals and base metal raw materials and compounds, not elsewhere specified:				
Ores and concentrates, not elsewhere specified. thousand tons	311	319	(2)	Norway 201; Canada 66; Australia 34.
Ashes and residues do	59	51	21	Netherlands 8; Belgium-Luxembourg 8; United States 7; France 5; Switzerland 3.

See footnotes at end of table.

TABLE 5.—Federal Republic of Germany: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal sources
Metals—Continued				
Other base metals—Continued				
Oxides and hydroxides, not elsewhere specified:				
Barium, strontium, and magnesium.	22	15	NA	NA.
Nickel, molybdenum, vanadium, tungsten.	497	308	132	United Kingdom 135; Netherlands 82; France 50.
Other	338	509	65	United States 221; United Kingdom 167.
Metals, unwrought or semimanufactures, not elsewhere specified:				
Arsenic and tellurium	37	32	--------	Sweden 16; Poland 12.
Boron and nitrogen	23	24	24	All from Netherlands.
Columbium and titanium	332	388	11	United States 329; Japan 26.
Selenium and phosphorus	3,900	9,201	229	United States 8,276; United Kingdom 610; France 224.
Alkali, alkaline earth and rare earths.	457	1,612	1,491	France 1,491; United Kingdom 110.
Nonmetals:				
Asbestos:				
Crude, washed or ground. thousand tons	128	143	3	Canada 79; U.S.S.R. 29; Rep. of South Africa 21; Fed. of Rhodesia and Nyasaland 9.
Semimanufactures:				
Asbestos or cellulose fiber cement. do	89	98	57	Belgium-Luxembourg 45; Sweden 18; Austria 11.
Fabricated asbestos (except fricton materials).	5,235	6,632	3,437	France 2,107; United Kingdom 2,086; Netherlands 1,185.
Barite and witherite	1,112	5,853	1,487	Morocco 4,179; France 1,487.
Barium sulfate	79	155	58	Netherlands 55.
Boron salts:				
Crude natural	32,780	44,625	25	United States 44,102; Turkey 498.
Oxides and acids	7,525	6,845	4,655	France 2,598; United States 2,183; Italy 2,057.
Bromine and fluorine	10	6	--------	NA.
Cement, hydraulic thousand tons	367	349	253	France 251; Switzerland 53; Poland 21.
Cement products do	357	533	494	Netherlands 335.
Chalk do	133	127	100	France 89; Denmark 27.
Chlorine	20,010	20,432	12,610	Italy 9,335; Switzerland 7,386; Belgium-Luxembourg 3,048.
Clays and refractories, not elsewhere specified:				
China clay (kaolin). thousand tons	299	339	37	United Kingdom 232; France 36; Czechoslovakia 11.
Fire clay do	147	172	37	Czechoslovakia 57; Rep. of South Africa 52; France 34.
Other clays [3] do	210	218	152	Netherlands 86; France 51; Czechoslovakia 18.
Refractory and heat insulating products, not elsewhere specified:				
Slag and rock wool. thousand tons	10	51	32	Austria 40; Denmark 6.
Heat insulating bricks	10,168	9,501	1,043	Denmark 6,594; Yugoslavia 1,229; France 1,039.
Other refractory bricks	13,097	7,649	4,160	France 3,131; United Kingdom 1,791.
Refractory cement and mortar	13,052	11,342	5,424	Belgium-Luxembourg 2,850; France 2,392; Austria 2,301; Spain 1,210.
Nonrefractory construction materials:				
Building bricks. thousand tons	571	525	425	Netherlands 361; Denmark 77.
Roofing tiles, etc do	69	49	36	Netherlands 18; France 17.
Other do	145	126	77	Netherlands 44; Italy 17; Belgium-Luxembourg 15; Denmark 11.
Corundum, artificial	2,829	3,342	1,273	France 1,262; Austria 862; Czechoslovakia 731; United States 413.
Cryolite and chiolite	3,368	2,982	--------	All from Denmark.

See footnotes at end of table.

TABLE 5.—Federal Republic of Germany: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal sources
Nonmetals—Continued				
Diamonds:				
Dust and powder of diamonds and other gem stones. thousand carats..	2,973	1,702	437	United States 1,143; Belgium-Luxembourg 343; Netherlands 92; United Kingdom 53.
Industrial diamonds thousand carets..	735	635	435	Belgium-Luxembourg 385; Rep. of South Africa 115; Netherlands 45; United Kingdom 35.
Gem diamonds, simply cut..do....	510	470	--------	NA.
Gem diamonds, otherwise worked. do....	125	130	90	Belgium-Luxembourg 65; Israel 35; Netherlands 20.
Diatomite and similar siliceous earths:				
Crude or calcined	75,278	62,645	7,569	Denmark 46,544; France 7,385; Yugoslavia 4,437; United States 3,603.
Dolomite, including mortar. thousand tons..	60	119	93	Belgium-Luxembourg 84; Norway 13; Austria 12.
Feldspar	32,856	37,863	20,405	Italy 12,648; Norway 9,186; France 7,703; Rep. of South Africa 4,617.
Fluorspar	65,617	47,391	25,410	France 24,740; Spain 10,750; Mainland China 5,564; Rep. of South Africa 1,299.
Gem stones, other than diamonds and pearls:				
Natural:				
Rough or simply worked. kilograms..	639,511	620,705	21,401	Brazil 386,354; Morocco 43,950; Rep. of South Africa 39,156; Uruguay 32,545; United States 25,109.
Otherwise worked.......do....	1,172	1,436	55	Mainland China 630; Japan 257; Switzerland 235; India 73.
Synthetic and reconstructed stones. do....	14,854	16,239	4,511	Switzerland 11,320; France 4,475.
Graphite	14,455	13,320	98	Austria 8,685; Czechoslovakia 1,667; Madagascar 1,088; U.S.S.R. 481.
Gypsum and anhydrite, crude. thousand tons..	65	74	31	Austria 43; France 31.
Gypsum products..........do....	13	23	9	Belgium-Luxembourg 7; Ireland 6; Sweden 6.
Iodine	318	313	--------	Chile 230; Japan 83.
Lime..........thousand tons..	77	67	62	France 61; Poland 5.
Limestone..........do....	299	382	92	Sweden 273; France 75; Belgium-Luxembourg 16.
Magnesite:				
Crude or sintered..........do....	102	105	1	Austria 67; Spain 10; Greece 10.
Caustic calcined..........do....	112	104	3	Austria 77; Greece 15; India 5.
Dolomite, magnesite and chrome-magnesite products. do....	39	35	3	Austria 17; Norway 6; Yugoslavia 6.
Mica:				
Crude, splittings and scrap	4,483	4,485	27	India 2,335; Norway 721; United Kingdom 445; United States 406; Rep. of South Africa 394.
Fabricated	82	108	81	France 75.
Phosphates:				
Phosphate rock....thousand tons..	1,622	1,642	--------	Morocco 718; United States 394; U.S.S.R. 255; Senegal 156.
Phosphatic slag (basic bessemer). do....	444	413	413	All from Belgium-Luxembourg.
Superphosphate, P_2O_5 content. do....	7,215	8,054	6,156	Netherlands 3,616; Belgium-Luxembourg 2,408; Poland 1,890.
Other phosphate fertilizers, P_2O_5 content.	277	256	256	Belgium-Luxembourg 253.
Pigments, not elsewhere specified:				
Natural earth	2,095	2,248	700	Austria 1,030; France 599; Sierra Leone 444.
Iron oxides and hydroxide	888	1,036	433	France 396; United Kingdom 244; Spain 185.
Potash salts:				
Crude..........thousand tons..	15	17	17	All from France.
Other [4]..........do....	22	32	29	France 23; Italy 6; Israel 3.
Pumice..........do....	10	192	175	Italy 174; Greece 16.
Quartz and quartzite..........do....	28	25	3	Norway 8; Sweden 7; Yugoslavia 4.

See footnotes at end of table.

TABLE 5.—Federal Republic of Germany: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962 total	1963		
		Total	EEC	Principal sources
Nonmetals—Continued				
Sand, natural, except metal bearing. thousand tons	1,110	1,211	1,178	France 562; Belgium-Luxembourg 314; Netherlands 303.
Slate, crude or rough split do	5	5	3	Italy 1; France 1; Norway 1.
Slate products do	12	12	9	Italy 7; Portugal 1; Belgium-Luxembourg 1.
Stone:				
Marble and other calcareous do	115	131	64	Italy 43; Austria 37; France 14; Portugal 9.
Other dimension stone do	562	456	24	Sweden 179; Denmark 102; Austria 71.
Gravel and crushed stone do	495	690	364	Denmark 245; France 189; Netherlands 104.
Shaped natural paving stone do	123	113	2	Portugal 72; Austria 18; Poland 12.
Worked stone do	51	57	43	Italy 37; France 5.
Sulfur and pyrites:				
Elemental sulfur do	220	292	119	France 118; Mexico 86; United States 76.
Pyrites, unroasted do	1,337	1,500	--------	Spain 653; Norway 508; Finland 95.
Talc and soapstone, natural do	51	50	17	Austria 19; France 11; Norway 8; Italy 6.
Mineral fuels and energy:				
Coal, anthracite and bituminous. do	7,295	7,762	1,412	United States 5,090; United Kingdom 616; France 535; Belgium-Luxembourg 472; Poland 429; Netherlands 405.
Briquets, anthracite and bituminous. do	377	653	623	Netherlands 390; Belgium-Luxembourg 233.
Lignite and lignite briquets do	1,357	1,571	23	Czechoslovakia 1,432.
Peat and peat briquets do	28	31	26	Netherlands 26.
Coke do	439	432	304	Netherlands 282; Czechoslovakia 109.
Coal tar do	29	57	([2])	Czechoslovakia 41; Denmark 8; Canada 7.
Petroleum and petroleum products: [5]				
Crude, including shale oil thousand tons	33,207	40,093	2,604	Iran 9,741; Libya 6,325; Iraq 5,429; Venezuela 4,384; Saudi Arabia 4,190; Kuwait 2,667; Qatar 1,285.
Gasoline do	1,032	1,021	557	France 245; Netherlands 173; Netherlands Antilles 120; Belgium-Luxembourg 110; U.S.S.R. 98; Rumania 73; Bahrain 68.
Kerosine, including jet fuel do	182	198	111	Belgium-Luxembourg 72; Netherlands Antilles 67.
Distillate fuels do	1,100	1,442	572	Netherlands 415; Venezuela 407; Netherlands Antilles 153; France 132; U.S.S.R. 107.
Residual fue loils do	9,386	10,432	3,908	Netherlands 2,107; Venezuela 1,822; Netherlands Antilles 1,187; France 838; Italy 836.
Lubricants do	218	178	30	United States 57; United Kingdom 35; Venezuela 32; Netherlands Antilles 18; France 17; Netherlands 11.
Mineral waxes do	37	32	5	United States 16; Netherlands 4; United Kingdom 2.
Pitch and pitch coke do	38	42	6	Czechoslovakia 23; Netherlands 7; Poland 5.
Petroleum coke do	123	168	2	United States 157; Switzerland 9.
Bitumens and asphalt do	504	887	647	Netherlands 296; Belgium-Luxembourg 196; Italy 150; Rumania 113.
Other coal and petroleum products not elsewhere specified. do	13	10	2	United States 7.
Gas:				
Natural and liquid petroleum gases. do	23	35	35	Netherlands 18; France 14.
Manufactured gas. thousand cubic meters	311	559	559	All from Netherlands.

NA Not available.

[1] Includes cast iron pipes and fittings: 1962—654 tons; 1963—1,014 tons.

[2] Less than ½ unit.

[3] Includes andalusite, dinas clays, etc.

[4] Includes potassium chloride, potassium sulfate and potassium-magnesium sulfate.

[5] Includes some coal distillation products, not elsewhere specified.

COMMODITY REVIEW

METALS

Iron and Steel.—The Federal Republic's output of 37.34 million tons of crude steel in 1964 was 45.0 percent of the European Coal and Steel Community (ECSC) output and 8.7 percent of estimated world production. After 3 years of successive declines, the West German iron and steel industry experienced a revival which started with increased foreign orders late in 1963 and which expanded to the domestic market in 1964. Record rates of production of crude steel were established in 1964. The previous yearly high set in 1960 was exceeded by 9.5 percent; a new monthly high was set in October when 3.341 million tons was produced; and a new daily average was attained in September when 116,500 tons was produced daily. Compared with 1963, output of pig iron increased 18.6 percent, crude steel 18.2 percent, and finished steel products 18.9 percent. Although the above figures indicate a remarkable improvement in the West German iron and steel industry during 1964 as compared with 1963, comparison with 1960 data shows that pig iron production increased 5.6 percent, crude steel 9.5 percent, and finished steel 10.8 percent over the 1960 levels, or at rates more in line with those recorded for the other five members of the ECSC (Belgium, France, Italy, Luxembourg, and the Netherlands) which showed 9.4-percent increase overall for crude steel output. However, the other ECSC countries maintained an annual average increase of more than 3 percent during the period 1960–64 while the production of the Federal Republic declined during 1961–63.

Continuing replacement of basic bessemer (Thomas) by oxygen-blown steel converters was reflected in data on production by process. Relative increases are shown by open-hearth steel which increased its share in total steel output from 44.4 percent in 1963 to 45.1 percent in 1964 and by oxygen-blown steel which increased its share of the total steel output from 7.8 percent in 1963 to 14.0 percent in 1964. Basic bessemer steel production declined by 1.6 percent in terms of gross production while its share of total crude steel decreased from 39.4 to 32.8 percent. Electric steel output, although increasing 13.3 percent in gross production, accounted for only 8 percent of total 1964 output, compared with 8.4 percent of total 1963 output. Corresponding changes also were shown in the relative proportions of pig iron types which supplied the steel furnaces.

In the production of finished steel, all classes except railroad track material showed substantial increases; most notable gains were reported for hoop and strip (25.5 percent), wire rod (24.9 percent), heavy plates (22.7 percent), and fine plates and sheets (20.8 percent.)

TABLE 6.—Federal Republic of Germany: Iron and steel salient statistics

(Thousand metric tons unless otherwise specified)

	1960	1961	1962	1963	1964
IRON AND MANGANESE ORES AND CONCENTRATES					
Production of iron ore:					
Mine run ore	18,869	18,866	16,643	12,898	11,613
Percent iron	26.7	26.6	26.8	27.0	27.1
Marketable ore:					
Gross weight:					
Direct shipping	[r] 5,789	[r] 6,332	[r] 5,959	[r] 4,076	4,148
Concentrates	[r] 8,396	[r] 7,736	[r] 6,467	[r] 5,429	4,549
Total	[r] 14,185	[r] 14,067	[r] 12,426	[r] 9,505	8,697
Iron content:					
Direct shipping	1,557	1,673	1,598	1,128	1,142
Concentrates	2,855	2,696	2,295	1,946	1,654
Total	[r] 4,412	[r] 4,369	[r] 3,892	[r] 3,074	2,796
Shipments of marketable ore	[r] 14,629	[r] 14,136	[r] 12,211	[r] 9,405	8,610
Iron content	[r] 4,508	[r] 4,351	[r] 3,792	[r] 3,030	786
Stocks at yearend (as reported)	[r] 1,091	[r] 1,273	[r] 1,894	[r] 2,254	2,218
Iron content	310	381	573	698	673
Consumption:					
Gross weight:					
Domestic iron ore	13,977	13,451	11,457	8,799	8,119
Imported iron ore	31,398	31,537	29,742	27,487	33,630
Imported manganese ore	354	356	406	509	556
Iron and manganese ore, not separately reported	916	1,043	1,050	793	1,010
Total	46,645	46,387	42,655	37,588	43,315
Iron content:					
Domestic iron ore	4,223	4,065	3,508	2,777	2,580
Imported iron ore	15,019	15,161	14,513	13,935	17,839
Imported manganese ore	52	53	52	60	65
Iron and manganese ore, not separately reported	586	713	707	520	648
Total	19,880	19,992	18,780	17,292	21,132
SCRAP					
Arisings from own works	10,866	10,906	10,682	10,292	12,119
Purchased scrap including imports	7,273	7,018	6,842	6,771	8,230
Other including variations in stock estimates	1,639	1,904	1,687	1,742	2,132
Total new supply	19,778	19,828	19,211	18,805	22,481
Consumption in iron and steel making	18,553	18,399	18,152	17,988	20,820
Consigned for export	1,241	1,417	1,171	1,267	1,346
Stocks:					
Additions	----------	12	----------	----------	315
Withdrawals	16	----------	112	450	----------
Stocks at end of year	2,569	2,581	2,469	2,019	2,334
SINTER					
Production	22,899	24,389	25,832	24,925	28,705
Iron content	11,557	12,343	13,345	12,989	15,286
Consumption of raw materials:					
Gross weight:					
Iron ore:					
Domestic	8,677	8,694	7,670	6,416	6,400
Imported	11,357	13,487	15,849	15,579	18,728
Subtotal (total ores)	20,034	22,181	23,519	21,995	25,128
Melting plant and rolling mill scale and cinder	5,265	4,903	4,966	4,855	5,164
Blast furnace dust	3,071	2,775	2,524	2,150	2,545
Limestone	475	668	815	936	1,110
Phosphate rock	----------	----------	5	19	43
Total raw materials	28,845	30,527	31,829	29,955	33,990

See footnotes at end of table.

TABLE 6.—Federal Republic of Germany: Iron and steel salient statistics—Continued

(Thousand metric tons unless otherwise specified)

	1960	1961	1962	1963	1964
SINTER—Continued					
Consumption of raw materials—Continued					
Iron content:					
Iron ore:					
Domestic	2,622	2,645	2,338	1,943	1,947
Imported	5,359	6,358	7,707	7,897	9,821
Subtotal	7,981	9,003	10,045	9,840	11,768
Other materials	3,664	3,423	3,380	3,220	3,602
Total	11,645	12,426	13,425	13,060	15,370
PIG IRON					
Producing plants, number	39	39	37	36	35
Blast furnaces in existence, number	156	154	153	147	147
Blast furnaces in operation at end of year	129	123	118	106	113
Production of pig iron and blast furnace ferroalloys	25,739	25,431	24,251	22,909	27,182
Consumption of raw materials:					
Gross weight:					
Iron ore, direct consumption:					
Domestic	5,300	4,757	3,787	2,383	1,719
Imported	20,041	18,050	13,893	11,908	14,902
Manganese ore, direct consumption	354	356	406	509	556
Total ore	25,695	23,163	18,086	14,800	17,177
Other iron bearing materials:					
Scale, slag, cinder and dust	4,810	4,455	3,992	3,479	3,710
Scrap	919	891	834	752	799
Sinter and briquets	22,914	24,293	25,652	24,969	28,658
Total other iron bearing materials	28,643	29,639	30,478	29,200	33,167
Limestone	3,220	2,648	2,111	1,704	1,882
Phosphate rock	320	491	467	544	542
Coke:					
Total consumed	21,471	20,419	18,264	16,626	18,932
Kilograms per ton of pig iron produced	826	797	748	719	691
Iron content:					
Domestic iron ore	1,601	1,420	1,170	834	633
Imported iron ore	9,660	8,803	6,806	6,038	8,018
Manganese ore	52	53	52	60	65
Total iron content of ores	11,313	10,276	8,028	6,932	8,716
Content of other iron bearing materials	13,881	14,505	15,370	15,024	17,384
Total	25,194	24,781	23,398	21,956	26,100
STEEL					
Converters:					
Basic bessemer:					
In existence	88	87	87	78	65
In operation at end of year	72	72	69	60	51
Oxygen:					
In existence	5	8	11	14	18
In operation at end of year	3	5	9	12	13
Furnace:					
Open hearth:					
In existence	224	209	202	190	189
In operation at end of year	170	135	113	134	131
Electric:					
In existence	169	179	182	182	185
In operation at end of year	150	150	145	150	163

TABLE 6.—Federal Republic of Germany: Iron and steel salient statistics—Continued

(Thousand metric tons unless otherwise specified)

	1960	1961	1962	1963	1964
STEEL—Continued					
Production of crude steel:					
Basic bessemer	14,906	14,368	13,211	12,440	12,239
Oxygen	863	1,201	1,684	2,452	5,226
Open hearth	16,087	15,457	15,048	14,017	16,836
Electric	2,174	2,365	2,567	2,647	2,998
Other	70	67	53	41	40
Total	34,100	33,458	32,563	31,597	37,339
Of which:					
Ingots	33,428	32,728	31,893	31,022	36,702
Liquid steel for castings	672	730	670	575	637
Consumption of raw materials in steel ingots:					
Pig iron: [3]					
Total consumed	23,382	22,757	21,965	21,012	24,943
Kilograms per ton crude steel	686	680	675	666	668
Scrap: [2]					
Total consumed	13,209	12,910	12,871	12,960	15,122
Kilograms per ton crude steel	387	386	395	411	405
Other metals (ferroalloys, alloying metals, etc.):					
Total consumed	921	878	869	878	1,028
Kilograms per ton crude steel	27	26	27	28	28
Iron and manganese ores	916	1,043	1,050	793	1,010
Limestone	3,081	2,921	2,781	2,618	2,970
CASTINGS					
Iron and steel foundries in operation, number	1,115	1,107	1,087	1,064	1,040
Production of good castings	4,253	4,281	4,088	3,858	4,412
Consumption of raw materials:					
Pig iron	2,016	1,951	1,848	1,693	1,857
Scrap	4,419	4,597	4,446	4,275	4,899
Ferroalloys and other metals	63	68	63	62	74
Total	6,498	6,616	6,357	6,030	6,830
EMPLOYMENT					
Iron ore production and concentrating:					
Underground mines number of persons employed	12,149	11,343	8,448	6,130	5,325
Open pit mines do	422	267	302	325	156
Surface plants do	7,075	6,584	5,293	4,309	3,840
Total do	19,646	18,194	14,043	10,764	9,321
Of which:					
Laborers do	17,262	15,919	12,136	9,239	7,963
Salaried do	2,384	2,275	1,907	1,525	1,358
Male do	19,085	17,672	13,645	10,458	9,014
Iron and steel:					
Labor: [3]					
Coking plants at smelters number of persons employed	3,169	3,085	3,032	2,539	2,101
Blast furnace and sinter plants number of persons employed	15,484	15,172	14,338	12,388	13,219
Steelmaking do	30,743	28,893	28,074	25,644	27,378
Rolling mills do	64,156	61,969	61,626	60,713	65,130
Tube works do	15,165	15,046	14,324	14,063	13,723
Extrusion and forge works do	14,488	15,159	14,165	13,296	13,286
Other hot mills do	3,459	3,804	3,641	3,373	3,226
Ancillary works and operations do	125,875	128,446	126,043	123,094	111,091
Administration do	7,319	6,905	7,294	7,063	7,097
Total	279,858	278,479	272,537	262,173	256,251
Salaried,[3] total	47,373	50,866	52,603	52,631	54,794
Grand total	327,231	329,345	325,140	314,804	311,045

---

[r] Revised.
[1] Includes Krupp-Renn nodules.
[2] Includes pig iron and scrap consumed in preblown basic bessemer steel added to open-hearth furnaces.
[3] Includes apprentices.

Although exports of finished steel products reached a new high, imports increased at a greater rate to meet the increased domestic demand. While exports of pig iron and crude steel declined, exports of steel semimanufactures increased 6.5 percent, to 6.9 million tons with shapes and flat rolled products accounting for the major portion. The Common Market accounted for about 49 percent of the total and the EFTA about 20 percent. The United States received 542,000 tons, accounting for nearly 8 percent of the total. Imports of crude steel increased 411,000 tons or 59 percent over those of 1963, and imports of steel semimanufactures increased 19 percent to 4.3 million tons. Shapes and flat rolled products also provided the bulk of semimanufacture imports, with the EEC accounting for 85 percent of the total and the EFTA for 11 percent. The favorable export balance in finished steel categories decreased from 2.82 million tons in 1963 to 2.55 million tons in 1964.

TABLE 7.—Federal Republic of Germany: Foreign trade in iron and steel

(Thousand metric tons)

	1963	1964						
		Total	Distribution by area					
			EEC	EFTA	East Europe	Other Europe	United States	All other
Exports:								
Iron ores and concentrates [1]	289	304	19	284	--------	1	--------	--------
Iron and steel scrap	1,327	1,341	1,204	111	--------	12	--------	14
Pig iron and ferroalloys [2]	913	741	481	116	21	18	71	34
Crude steel	1,462	1,460	910	219	1	151	70	109
Finished steel:								
Angles, shapes and sections	2,623	2,690	1,437	431	22	119	263	418
Plates and sheets	2,074	2,373	1,195	515	118	158	171	216
Hoop and strip	373	440	242	75	32	35	14	42
Railway track material	184	134	65	31	1	6	6	25
Wire	173	189	65	29	16	12	26	41
Tubes, pipes and fittings	996	1,040	343	262	128	54	62	191
Castings and forgings unwrought	25	23	9	9	--------	1	--------	4
Total	6,448	6,889	3,356	1,352	317	385	542	937
Imports:								
Iron ores and concentrates [1]	28,915	36,973	7,143	10,790	468	1,576	--------	16,996
Iron and steel scrap	638	1,765	687	499	--------	16	500	63
Pig iron and ferroalloys [2]	704	570	196	198	10	80	6	80
Crude steel	695	1,106	509	441	106	7	24	19
Finished steel:								
Angles, shapes and sections	1,460	1,779	1,553	158	52	10	1	5
Plates and sheets	1,724	1,978	1,662	265	21	10	14	6
Hoop and strip	270	345	312	16	14	--------	2	1
Railway track material	10	11	7	4	--------	--------	--------	--------
Wire	49	53	41	12	--------	--------	--------	--------
Tubes, pipes and fittings	130	168	118	32	10	5	1	2
Castings and forgings, unwrought	6	8	6	1	--------	--------	1	--------
Total	3,649	4,342	3,699	488	97	25	19	14

[1] Includes burnt pyrites.
[2] Includes iron and steel shot, powder and sponge.

Because of decreasing input of low-grade domestic iron ore and its replacement with higher grade imported ore and scrap, three more mines were closed down and domestic ore production again declined.

Consumption of domestic ore in 1964 exceeded production; however, the deficit of about 37,000 tons was supplied from stocks.

Total scrap consumption in 1964 amounted to 20.8 million tons, an increase of 15.7 percent over that of 1963. The increase was met partially by increased domestic arisings and partially by a threefold increase in imports from 0.6 million tons in 1963 to 1.8 million tons in 1964.

Further changes in the pattern of fuel consumption by the iron and steel industry were evident as petroleum continued to replace coal where applicable and as the processing of iron ores and continued increase in operating efficiency of blast furnaces further reduced the coke input per ton of pig iron produced from 791 kilograms in 1963 to 691 kilograms in 1964. Consumption of liquid fuels in iron and steelmaking were reported at about 2.5 million tons, an increase of 29.6 percent over 1963 consumption. Oxygen consumed in iron and steelmaking increased from 608,000 cubic meters in 1963 to 882,000 cubic meters in 1964.

Nonferrous Metals.—The industrial revival that started late in 1963 became apparent in the nonferrous metals industries early in 1964 with the development of a backlog of orders for base and light metal semimanufactures and foundry products in excess of the industries' ability to fill from domestically produced metals. The increased demand fell most heavily on the copper and aluminum processing industries but included all of the principal nonferrous base metals and alloys.

Output of aluminum, magnesium, copper, lead, nickel, tin, and zinc metal and alloy semimanufactures and crude castings increased almost 25 percent, from about 1.26 million tons in 1963 to about 1.57 million tons in 1964. Highest gains were in copper production with a 27 percent increase, followed in order by aluminum, zinc, and lead, output of all of which increased by more than 20 percent over 1963 levels. Of the total production of these commodities by the EEC, the share produced in the Federal Republic amounted to: Copper and copper alloys 46.5 percent, aluminum and alloys 42.4 percent, and all others 36.5 percent.

Heavy demands on the primary and secondary smelters found the former short of ore and concentrate supplies on both the domestic and world markets, so that new production was limited. A substantial supply of suitable copper, aluminum, and zinc scrap was available from EEC sources, however, so that a moderate increase in total metal production was possible, and with increased metal imports, metal processing industries were able to operate at capacity. Overall production of metals listed in the previous paragraph, both primary and secondary, increased 8.4 percent, from 1.18 million tons in 1963 to 1.28 million tons in 1964. Detailed increases by commodity included copper 11.6 percent, aluminum 10.9 percent, and zinc 10.8 percent. Tin showed a slight gain but lead declined because of inadequate ore supplies attributable to the prolonged depression in lead prices. There was a moderate increase in domestic zinc concentrate output from the recently commissioned additional flotation facilities at the Meggen pyrites mine. However, the total zinc concentrate supply was short.

Requirements of the home market restricted the expansion of exports of crude metals and semifabricated products to 1.5 percent above the 1963 level. Imports of metals and products, however, increased by about 185,000 tons to 1.09 million tons, a gain of 20.5 percent over 1963 imports.

TABLE 8.—Federal Republic of Germany: Foreign trade in nonferrous base metals

(Metric tons unless otherwise specified)

Commodity	1963 total	1964						
		Total	EEC	EFTA	East Europe	Other Europe	United States	All other
Exports:								
Copper and copper alloys, unwrought	74,340	78,252	22,058	28,776	6,680	3,293	--------	17,445
Copper and copper alloys, wrought	72,790	78,052	22,877	17,765	5,620	2,672	21,218	7,900
Nickel and nickel alloys, unwrought	159	276	181	--------	68	24	--------	3
Nickel and nickel alloys, wrought	4,381	4,376	2,080	1,106	92	367	139	592
Aluminum and aluminum alloys, unwrought	14,184	9,837	6,970	1,956	--------	84	--------	827
Aluminum and aluminum alloys, wrought	54,787	57,565	23,684	15,280	1,468	2,764	7,027	7,342
Lead and lead alloys, unwrought	17,968	21,592	13,011	3,335	--------	395	4,006	845
Lead and lead alloys, wrought	2,997	3,917	1,074	1,506	--------	477	--------	860
Zinc and zinc alloys, unwrought	29,870	21,501	9,070	5,330	--------	1,679	350	5,072
Zinc and zinc alloys, wrought	5,656	5,549	1,128	1,880	--------	349	--------	2,192
Tin and tin alloys, unwrought	1,387	1,502	737	457	49	29	150	80
Tin and tin alloys, wrought	131	122	46	46	--------	13	--------	17
Other nonferrous base metals, not elsewhere specified [1]	3,567	3,915	722	1,520	3	96	1,238	336
Total	282,217	286,456	103,638	78,957	13,980	12,242	34,128	43,511
Imports:								
Copper and copper alloys, unwrought	416,765	488,513	105,522	61,078	5,790	7,229	49,076	259,818
Copper and copper alloys, wrought	26,496	42,905	32,851	6,420	--------	1,156	394	2,084
Nickel and nickel alloys, unwrought	19,217	23,403	742	13,640	11	1,414	2,332	5,264
Nickel and nickel alloys, wrought	907	1,376	390	635	--------	35	219	97
Aluminum and aluminum alloys, unwrought	120,671	165,274	14,703	54,309	--------	108	36,507	59,647
Aluminum and aluminum al. loys, wrought	18,440	28,843	22,770	3,461	--------	930	1,670	12
Lead and lead alloys, unwrought	100,562	100,048	36,376	27,054	4,114	1,949	--------	30,555
Lead and lead alloys, wrought	1,843	2,149	1,588	--------	--------	529	--------	32
Zinc and zinc alloys, unwrought	136,109	167,276	78,016	12,680	24,755	6,845	1,087	43,893
Zinc and zinc alloys, wrought	11,268	11,413	6,031	132	--------	4,448	--------	802
Tin and tin alloys, unwrought and wrought [2]	11,803	13,845	8,782	1,371	--------	24	--------	3,668
Other nonferrous base metals, not elsewhere specified [1]	39,705	43,798	5,813	18,969	1,607	295	11,678	5,436
Total	903,786	1,088,843	313,584	199,749	36,277	24,962	102,963	411,308

[1] Includes magnesium, beryllium, tungsten, molybdenum, tantalum and others.

[2] Includes wrought products: 1963—21 tons; 1964—19 tons.

Source: UN Statistical Papers. Commodity Trade Statistics. Series D, v. 3, No. 1-15, and v. 4, No. 1-18.

NOTE: This table is not exactly comparable with industrial commodities in tables 2 and 3 because of slight differences in group classification.

Consumption of the six principal nonferrous base metals in the Federal Republic in 1964 was estimated at about 1.54 million tons of which copper accounted for 38 percent, aluminum about 23 percent, zinc 20.5 percent, and lead about 16.6 percent.

TABLE 9.—Federal Republic of Germany: Consumption of principal nonferrous base metals

(Thousand metric tons)

Commodity	1960	1961	1962	1963	Total	1964 [a] percent of European Economic Community
Aluminum	304.1	290.5	293.3	303.4	350.0	40.5
Copper	515.9	561.9	500.6	493.5	585.0	47.5
Lead	239.7	231.1	242.0	243.6	255.0	40.5
Nickel	21.8	20.4	17.4	17.4	21.4	44.8
Tin	16.1	15.7	13.1	12.5	13.5	34.1
Zinc	296.7	306.0	291.0	280.4	315.0	39.3
Total	1,394.3	1,425.6	1,357.4	1,350.8	1,539.9	----------

[a] Estimated.

Source: METALL, Zietschrift für Technik, Industrie und Handel. Berlin-Grunewald. January 1965, p. 53.

MINERAL FUELS

In 1964 gross energy requirements in the Federal Republic increased 3.6 percent. The consumption of coal of all types on an energy content basis decreased about 2.8 percent and the share of solid fuels in total energy consumed declined from 63.7 percent in 1963 to 59.7 percent in 1964. The differences were supplied by petroleum and natural gas, consumption of which increased 16 percent and 53 percent, respectively, increasing their combined share in the supply of total energy consumed from 33.3 percent in 1963 to 37.6 percent in 1964.

Coal.—The desired annual output figure of 140 million tons for anthracite and bituminous coal was attained but only by adding more than 4 million tons to stocks. In proposed rationalization projects, certain of the uneconomic mines with a total capacity of about 25 million tons were scheduled for closing. About 18 million tons, however, will be made up from more efficient producers.

TABLE 10.—Federal Republic of Germany: Energy balance [1]

(In million tons of standard coal equivalent (SCE))

	1960	1961	1962	1963	1964
Domestic production:					
Coal, all types	171.5	172.1	171.5	173.9	175.1
Petroleum and shale oil	7.9	8.9	9.7	10.6	11.0
Hydroelectric power	4.8	4.8	4.6	4.5	4.4
Natural gas [2]	1.1	1.2	1.4	1.9	2.7
Peat and fuelwood	1.8	1.6	1.8	1.9	1.9
Other fuels	.2	.2	.2	.2	.2
Total	187.3	188.8	189.2	193.0	195.3
Imports:					
Coal, all types	11.6	11.4	13.3	14.5	13.2
Petroleum	44.4	54.3	65.4	[3] 81.5	[3] 94.9
Hydroelectric power	2.4	2.4	2.2	2.5	2.5
Total	58.4	68.1	80.9	98.5	110.6
Supply from or to stocks: [4]					
Coal, all types	+6.9	+.9	+3.2	+3.5	−4.4
Petroleum and natural gases	−1.5	−.2	(5)	−2.1	−1.8
Total	+5.4	+.7	+3.2	+1.4	−6.2
Exports:					
Coal, all types	29.8	29.2	29.8	30.3	26.8
Petroleum	3.9	6.7	5.6	7.1	7.8
Hydroelectric power	.7	.7	1.0	1.5	2.1
Manufactured gas	.2	.2	.2	.2	.1
Total	34.6	36.8	36.6	39.1	36.8
Consumption: [6]					
Coal, all types	160.2	155.2	158.2	161.6	157.1
Petroleum and shale oil	46.8	56.3	69.5	82.9	96.3
Hydroelectric power	6.5	6.5	5.8	5.5	4.8
Natural gas	.9	1.0	1.2	1.7	2.6
Peat and fuelwood	1.8	1.6	1.8	1.9	1.9
Other fuels	.2	.2	.2	.2	.2
Total	216.4	220.8	236.7	253.8	262.9

[1] Includes West Berlin.
[2] Unassociated and associated natural gas and drained gas from coal mines.
[3] Includes small quantities of gas.
[4] Plus sign (+) indicates withdrawals from stocks, minus sign indicates additions to stocks
[5] Less than 50,000 tons.
[6] Domestic production plus imports minus exports adjusted for stock variations.

Source: Statistik der Kohlenwirtschaft. Zahlen zur Kohlenwirtschaft. Essen. No. 68 May 1965, p. 4.

Petroleum and Natural Gas.—Important additions to known fuel resources for the West German economy were made through the discovery of gas at Groothusen in East Friesland, across the Ems estuary from Bierum in the Netherlands where gas had been discovered late in 1963. This is an extension of the Groningen gasfield under the Continental Shelf at the mouth of the Ems River. Reserves under the bed of the Ems are shared equally between N.V. Nederlandsche Aardolie Mij (NAM), which owns the rights at Bierum on the Netherlands side, and Gewerkschaft Brigitta, which owns the rights at Groothusen on the West German side. Both companies are subsidiaries of Esso A.G. Hamburg and Deutsche Shell Aktiengesellschaft, Hamburg. Further natural gas discoveries also were made in the Ems-Weser field in the Province of Oldenburg.

TABLE 11.—Federal Republic of Germany: Coal industry

(Employment and output, by district)

	1960	1961	1962	1963	1964
Bituminous and anthracite:					
Ruhr:					
Production[1] million tons	115.4	116.1	115.9	117.2	117.6
Employment:					
Underground thousand persons	245.2	230.8	213.2	200.7	192.0
Mine surface do	68.2	64.8	61.3	57.2	54.9
Cleaning do	26.2	26.0	25.4	24.2	23.1
All other do	68.4	66.0	63.7	61.9	61.3
Total do	408.0	387.6	363.6	344.0	331.3
Output per man-shift:					
Underground kilograms	2,102	2,246	2,417	2,575	2,681
Total mining do	1,639	1,749	1,878	2,011	2,097
Saar:					
Production million tons	16.2	16.1	14.9	14.9	14.7
Employment:					
Underground thousand persons	35.3	31.7	28.4	26.1	24.5
Mine surface do	(2)	6.8	6.4	6.1	5.8
Cleaning do	2.4	2.2	2.2	2.2	2.2
All other do	(2)	10.3	10.2	9.5	9.2
Total do	55.8	51.0	47.2	43.9	41.7
Output per man-shift:					
Underground kilograms	2,013	2,197	2,369	2,531	2,616
Total mining do	1,586	1,807	1,925	2,050	2,123
Aachen:					
Production million tons	8.2	8.4	8.1	7.8	7.7
Employment:					
Underground thousand persons	20.8	19.6	18.0	16.5	16.1
Mine surface do	5.4	5.1	4.8	4.2	4.0
Cleaning do	1.1	1.1	1.0	1.0	1.0
All other do	4.4	4.5	4.5	4.4	4.4
Total do	31.7	30.3	28.3	26.1	25.5
Output per man-shift:					
Underground kilograms	1,702	1,836	1,929	1,998	1,990
Total mining do	1,332	1,452	1,522	1,596	1,598
Lower Saxony:					
Production million tons	2.4	2.2	2.3	2.3	2.3
Employment:					
Underground thousand persons	6.2	5.0	4.8	4.8	4.7
Mine surface do	1.7	1.5	1.4	1.4	1.4
Cleaning do	.6	.3	.3	.3	.3
All other do	1.0	.8	.8	.8	.8
Total do	9.5	7.6	7.3	7.3	7.2
Output per man-shift:					
Underground kilograms	1,739	1,969	2,082	2,059	2,114
Total mining do	1,340	1,520	1,602	1,498	1,644
Federal Republic, total:					
Production million tons	142.3	142.3	141.1	142.1	142.2
Employment:					
Underground thousand persons	307.6	287.2	264.4	248.1	237.3
Mine surface do	(2)	78.1	74.0	68.8	66.1
Cleaning do	30.3	29.7	28.9	27.7	26.6
All other do	(2)	81.6	79.1	77.0	75.7
Total do	505.0	476.6	446.4	421.6	405.7
Output per man-shift:					
Underground kilogram	2,057	2,207	2,372	2,521	2,614
Total mining do	1,605	1,731	1,853	1,978	2,055
Lignite and subbituminous:					
Rheinland:					
Production million tons	81.4	82.3	85.4	90.1	94.6
Employment:					
Open pit thousand persons	11.3	10.6	10.4	10.3	10.3
All other do	13.3	12.9	12.9	13.0	12.8
Total do	24.6	23.5	23.3	23.3	23.1
Other areas:					
Production million tons	14.7	14.9	15.9	16.5	16.3
Employment, total thousand persons	12.0	11.8	11.2	12.1	11.2

See footnotes at end of table.

TABLE 11.—Federal Republic of Germany: Coal industry—Continued

(Employment and output, by district)

	1960	1961	1962	1963	1964
Pitch coal:					
Bavaria:					
Production .... million tons..	1.8	1.8	1.8	1.8	1.9
Employment:					
Underground .... thousand persons..	4.6	4.3	3.9	3.8	3.8
All other .... do....	2.6	2.5	2.4	2.4	2.4
Total .... do....	7.2	6.8	6.3	6.2	6.0

[1] Excludes small mines and lessees.
[2] Included with total.

TABLE 12.—Federal Republic of Germany: Petroleum and natural gas production and reserves by area

	Production				Reserves[1]	
	1961	1962	1963	1964	Yearend 1963	Yearend 1964
Crude petroleum:						
North of the Elbe ...... thousand metric tons..	593	744	800	836	13,520	12,562
Between the Elbe and Weser Rivers .... do....	2,125	2,210	2,379	2,291	25,227	23,342
Between the Weser and Ems Rivers .... do....	1,582	1,624	1,710	1,921	27,594	28,079
West of the Ems .... do....	1,541	1,772	1,983	2,075	40,471	41,635
Upper Rhein Valley .... do....	217	235	250	243	3,148	2,560
Alpine foreland .... do....	146	191	261	307	1,860	2,930
Total .... do....	6,204	6,776	7,383	7,673	111,820	111,108
Change with respect to previous year percent..	+8	+9	+9	+4	−12	−1
Natural gas:						
Between Elbe and Weser Rivers million cubic feet..	666	861	1,193	1,742	60,350	60,350
Between Weser and Ems Rivers .... do....	5,082	5,047	12,019	24,525	1,633,000	3,333,450
West of Ems .... do....	4,572	6,105	9,306	14,620	429,550	660,300
Mouth of Ems[2] .... do....	--------	--------	--------	--------	2,485,000	2,485,000
Upper Rhein Valley .... do....	2,602	2,519	2,332	2,310	14,200	10,650
Alpine foreland .... do....	4,162	7,353	7,632	8,520	191,700	291,100
Total .... do....	17,084	21,885	32,482	51,717	4,813,800	6,840,850
Change with respect to previous year percent..	+16	+28	+48	+59	+183	+42

[1] Includes measured and probable reserves.
[2] West German portion of Groningen (Netherlands) field.

Source: Erdöl und Kohle—Erdgas-Petrochemie: Vol. 18, No. 5, May 1965, p. 342.

TABLE 13.—Federal Republic of Germany: Consumption of petroleum products

(Thousand metric tons)

	1960	1961	1962	1963	1964
Petroleum refinery products:					
Domestic deliveries:					
Liquid petroleum gases	554	690	810	1,031	1,323
Gasoline:					
Motor	5,451	6,279	7,262	8,127	9,297
Aviation	102	109	89	94	103
Special	74	76	77	79	90
High test	125	134	138	131	158
Natural	440	591	624	842	1,192
total	6,192	7,189	8,190	9,273	10,840
Kerosine	57	54	55	60	61
Jet fuel	122	204	270	363	476
Diesel fuel	4,666	5,354	5,922	6,481	6,973
Lubricants	650	674	701	699	805
Fuel oil	13,880	18,223	24,368	30,219	34,957
Paraffin and vaseline	66	64	62	76	75
Bitumen	1,355	1,679	2,054	2,756	3,236
Petroleum coke	139	170	198	229	266
Refinery gases	235	127	284	353	582
Extracts and residues	11	15	37	25	12
Other products	85	98	121	152	237
Total domestic deliveries	28,012	34,541	43,072	51,717	59,843
To bunkers	2,347	2,527	2,804	2,726	3,256
Consumed in refineries	1,787	2,126	2,449	3,096	3,896
Total petroleum	32,146	39,194	48,325	57,539	66,995
Fuel oil from coal and oil shale	451	467	468	403	325

Although the Government of the Federal Republic had not ratified the Continental Shelf Convention at yearend, pending clarification of rights in certain areas, mutual agreement had been reached with the Netherlands concerning areas of common interest. The question as to whether the rights over appropriate areas will be vested with the States (Laender) bordering the sea, or with the Federal Government, was not resolved, but pending a decision, the prerogative of granting exploration rights in the West German sector was assigned to the Oberbergamt (Mining Authority) at Clausthal.

Early in 1964 the German North Sea consortium originally consisting of nine major companies was given exploration rights covering a limited area of the Continental Shelf in the vicinity of Borkum and Juist islands. The consortium was later expanded to include 11 companies: Amoco Hanseatic Petroleum Co., Inc; Amphitrite Erdöl G.m.b.H; (French controlled); Gewerkschaft Brigitta (Shell-Esso); C. Deilmann Bergbau G.m.b.H; Deutsche Erdöl Gesellschaft (DEA); Deutsche Schachtbau- und Tiefbohr Gesellschaft mbH; Gelsenberg Benzin Aktiengesellschaft; Gewerkschaft Elwerath; Mobil Oil A.G. in Deutschland; Preussische Bergwerk-und Hütten A.G.; and Wintershall Aktiengesellschaft. The exploration rights, which will remain in effect until October 31, 1967, were made exclusive to cover all of the West German sector except certain small areas reserved for other German applicants.

Drilling off the island of Juist penetrated a reservoir of nitrogen under very high pressure in one of the upper formations causing water flooding that necessitated a change in location of the rig. At the second location, about 53 kilometers north of Juist, hydrocarbon gas was discovered at a depth of 4,225 meters, but seeping water required abandonment of this location before the area was fully evaluated.

In an endeavor to curb the growth rate of imported petroleum consumption at the expense of the domestic coal industry the Government, in November, reached an agreement with nine oil companies that account for about 85 percent of domestic sales. These companies agreed in principle to maintain the growth of fuel oil consumption at a rate to be fixed in advance by the Ministry of Economic Affairs in cooperation with the oil industry while considering the national economy as a whole. This agreement was supplemented in December by the promulgation of a new law making compulsory the licensing of imports of crude, fuel, and diesel oils.

New bills under preparation at yearend were designed to provide for compulsory maintenance of minimum specified stocks, compulsory registration of new pipeline and refinery projects, tax relief for power stations using coal, and subsidies for heating installations using coal.

The Mineral Industry of Greece

By Roman V. Sondermayer[1]

⁂

THE minerals sector of the Greek economy made a modest contribution to the country's gross national product (GNP) during 1964. Estimates set that contribution around 3 to 4 percent of the total. From the domestic point of view, production of bauxite, cement, lignite, and fertilizers were the most significant activities during the year. Greece's share of world mineral production was about 3 percent each for bauxite and barite and 2 percent for chromite and magnesite. Approximately 20,000 persons were employed in the mining industry out of a total population of 8.5 million. Lignite mines were the largest mineral industry employer; other major employers were nonmetals producers and bauxite mines.

Mineral output increased in 1964 relative to that of 1963. Overall basic metal production increased by 28 percent; nonmetallic production went up about 10 percent, and fuel production increased by 8 percent. The favorable development of the mineral industry of Greece was principally due to the governmental policy which favored investments in mineral industry and protected domestic production.

The construction of the aluminum smelter at Distomon, and the Esso-Pappas iron and steel plant near Thesaloniki were the highlights of the Greek mineral economy during 1964.

Mineral foreign trade again represented an important item in the overall foreign trade of the country; Greece continued to export raw materials such as bauxite, magnesite, bentonite, barite, and lead and zinc concentrates and remained an importer of high-rank coals, crude petroleum, and metallic semimanufactures.

By world standards the size of the mineral economy of Greece was small, but from the standpoint of domestic economic development, mineral industry activities were important steps toward industrialization and creation of the skilled labor force.

---

[1] Foreign mineral specialist, Division of International Activities.

GOVERNMENT POLICIES AND PROGRAMS

The need for capital investments in mineral enterprises continued to be the principal problem facing the Government.

Existing governmental regulations offered incentives for metallurgical investments. Imports of coke, coal, and ores by metallurgical companies were free of taxation as were loan contracts and interest on such contracts. Expenditure on modernization or expansion of plants was deductible from their taxable profit. Foreign investors were prominent throughout the industry because of a shortage of domestic capital, and their investments were welcomed because of their willingness to train laborers for the operations and because of their technical competence.

The Government of Greece was working on a plan for development of the country's mineral industry. The 4-year program sets the total investments at about $15 million.[2] The program will be implemented by the Greek Institute for Geology and Subsurface Research. The program includes $2.3 million for geological mapping and surface and aeromagnetic exploration, $6 million for mineral research and feasibility surveys of the development of minerals for which a demand exists in the world market, and $4 million for continued petroleum exploration and deep drilling. The balance would be spent for development of underground water resources, for exploration of volcanic areas with a view to examining the possibility of utilizing geothermic energy, and for hiring foreign experts to prepare studies on mine-development methods, mining costs and ore beneficiation. It was expected that the program would be approved in the beginning of 1965.

PRODUCTION

As in the past, cement and lignite output in nearly equal shares contributed about half of Greece's mineral production value during 1964. Steel and petroleum refining ranked third and fourth, far behind the leaders. Among crude minerals produced, bauxite was first followed by lead-zinc ores, sea salt, magnesite, iron ore, and chromite. Open pit mining prevailed for lignite and bauxite recovery, but the majority of other mineral production was obtained by underground mining methods. Modest drilling for petroleum performed by foreign contractors was conducted using modern methods and rotary rigs.

---

[2] Where necessary, values have been converted from drachmas (Dr) at the rate of Dr30 equals US$1.00.

TABLE 1.—Greece: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1960	1961	1962	1963	1964
Metals:					
Bauxite thousand tons	884	1,120	1,321	1,281	• 1,300
Chromite:					
Crude [2]	45,691	77,854	56,247	• 57,000	• 60,000
Marketable:					
Refractory ores (39.5 percent or higher Cr_2O_3)	19,428	16,913	4,900	5,200	NA
Concentrates:					
Metallurgical grade (53 percent Cr_2O_3)	15,454	13,863	14,837	11,444	NA
Submetallurgical grade (44.4 percent Cr_2O_3)	--------	362	4,424	--------	NA
Total	34,882	31,138	24,161	16,644	NA
Gold troy ounces	2,894	--------	--------	--------	--------
Iron and steel:					
Iron ore (46 to 52 percent Fe) thousand tons	297	292	212	36	60
Steel ingots and castings	• 125	• 140	• 155	209	240
Rolled products	NA	NA	NA	150	215
Lead:					
Concentrates:					
Gross weight	14,204	17,791	19,691	• 19,700	• 20,000
Metal content	9,200	11,600	12,800	• 13,200	• 14,400
Metal, smelter:					
Primary	1,990	2,277	4,345	• 3,500	NA
Other	1,101	687	NA	• 1,000	NA
Total	3,091	2,964	NA	• 4,500	• 5,000
Manganese concentrates (40 to 45 percent MnO_2)	31,216	28,300	13,696	14,868	• 30,000
Silver thousand troy ounces	105	113	138	158	NA
Zinc, concentrates:					
Gross weight	27,251	33,744	33,040	• 31,000	• 30,000
Metal content	14,700	17,547	17,181	• 18,200	• 18,000
Nonmetals:					
Barite thousand tons	102	75	71	• 85	68
Bentonite do	24	25	21	• 40	40
Cement do	^{r} 1,641	^{r} 1,837	^{r} 1,923	^{r} 2,294	2,672
Emery	7,000	7,200	7,600	7,500	7,600
Gypsum	85,197	89,686	94,284	• 95,000	• 95,000
Kaolin	26,000	25,200	34,958	• 35,000	• 30,000
Magnesite, crude thousand tons	187	148	^{r} 272	• 250	• 200
Marble thousand cubic meters	20	25	44	• 40	• 40
Perlite thousand tons	28	17	30	• 30	• 28
Pumice do	80	70	80	• 80	• 80
Pyrites do	164	188	144	• 150	• 140
Salt do	97	119	115	• 85	• 100
Santorin earth (pozzolan) do	180	190	188	• 200	• 200
Talc	1,822	1,854	2,415	• 2,500	• 2,800
Mineral fuels:					
Coal (lignite) thousand tons	^{r} 2,492	2,504	2,695	3,480	3,804
Fuel briquets do	88	66	81	141	• 90
Gas-coke do	23	23	22	21	• 14
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	1,906	1,976	1,953	2,178	2,254
Kerosine and jet fuel do	1,544	1,416	1,423	1,294	1,377
Distillate fuel oil do	3,324	3,783	4,048	4,503	4,364
Residual fuel oil do	5,068	5,219	5,092	4,755	4,837
Other do	246	227	468	601	698

---

[1] In addition to commodities listed, Greece produced a variety of simple construction materials and fertilizers, but complete production data were not available.

[2] Includes refractory and metallurgical ores.

• Estimate. ^{r} Revised. NA Not available.

TRADE

During 1964 Greece's principal trading partners were the members of the European Economic Community but European Communist countries made significant contributions to Greek mineral fuel requirements. The general characteristic of the Greek trade in minerals and related products was the export of raw minerals and import of semimanufactured products. Principal export items were bauxite, cement, magnesite, barite, lead-zinc concentrates, pyrites, bentonite, and chrome ore. The country's requirements for metal products, high-rank coals, coke, and petroleum were covered by imports.

TABLE 2.—Greece: Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Bauxite.....thousand tons..	901	1,118	U.S.S.R. 441; West Germany 362; France 90; United Kingdom 69.
Semimanufactures..........	797	942	Turkey 333; South Vietnam 253; Italy 235.
Chromite ores and concentrates.	19,537	15,327	Norway 10,125; West Germany 4,789; France 403.
Iron and steel:			
Iron ore and concentrate....	247,723	50,893	West Germany 36,040; Italy 9,453; Austria 5,400.
Roasted iron pyrites........	24,748	43,171	Netherlands 42,670.
Semimanufactures..........	2,927	2,349	Cyprus 1,962; Turkey 306.
Lead ore and concentrate.......	12,260	9,581	West Germany 8,185; Netherlands 950; France 446.
Manganese ore and concentrate.	7,780	12,451	United States 6,318; West Germany 2,230; France 2,112; United Kingdom 1,341.
Nickel, semimanufactures.......	----------	605	Netherlands 600.
Zinc ore and concentrate........	31,139	19,067	West Germany 9,574; France 9,347.
Nonmetals:			
Abrasives, natural..............	r 76,052	49,345	United States 31,145; West Germany 11,243; Italy 1,770; Spain 1,032; France 571; India 185; Netherlands 177; South Vietnam 171.
Barites........................	61,805	77,740	United States 43,687; Libya 16,963; Saudi Arabia 8,497; Kuwait 4,027; Bahrain 3,810; Netherlands 500.
Cement........................	29,017	49,693	Libya 39,838; Cyprus 9,852.
Clays..........................	48,656	63,636	France 21,997; Libya 20,963; West Germany 5,172; United Kingdom 5,063; Yugoslavia 3,955; Rumania 1,900; Iran 891.
Magnesite......................	104,350	112,060	Netherlands 28,249; United States 26,634; West Germany 20,990; Italy 14,109; United Kingdom 10,158; France 5,905.
Marble........................	16,671	21,035	Italy 6,614; West Germany 6,282; Netherlands 1,456; Switzerland 1,084; Spain 922; France 882; Japan 868.
Pyrites (unroasted).............	47,460	43,995	Italy 32,955; Austria 9,640.
Sulfur..........................	----------	4,461	Egypt 1,993; Ceylon 990.
Other nonmetals...............	17,741	21,233	United Kingdom 6,574; France 4,884; West Germany 3,600; Italy 3,050.
Mineral fuels:			
Petroleum refinery products:			
Distillate fuels...............	2,470	3,446	Sweden 723; West Germany 529; undisclosed 2,194.
Residual fuel oils...........	24,251	16,211	Liberia 5,016; United States 4,483; Lebanon 1,560; Italy 783; Norway 735.
Lubricants..................	----------	628	Israel 599.

r Revised.

TABLE 3.—Greece: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Metal	5,962	5,730	Canada 1,959; United States 1,899; Austria 857; France 730; Italy 195.
Semimanufactures	[r] 994	1,116	West Germany 550; Italy 212; Switzerland 126; Austria 60; France 54.
Copper:			
Unrefined metal	4,969	1,097	Belgium-Luxembourg 483; Federation of Rhodesia and Nyasaland 275; Republic of the Congo (Léopoldville) 120.
Refined metal	[r] 2,438	5,653	Republic of the Congo (Léopoldville) 3,118; Rhodesia 1,905; United States 279; United Kingdom 270.
Copper alloys	----------	12	United Kingdom 10.
Semimanufactures	[r] 493	661	West Germany 193; Canada 125; Italy 89; Belgium-Luxembourg 66.
Scrap	882	414	Canada 265; Panama 36; West Germany 23.
Iron and steel:			
Iron ore thousand tons	----------	142	Liberia 61; Peru 32; India 28; Algeria 20.
Pig iron do	45	30	U.S.S.R. 13; West Germany 9; Finland 5.
Steel ingots and other primary forms. do	[r] 109	70	West Germany 45; Sweden 19; Finland 2; U.S.S.R. 2.
Semimanufactures do	[r] 250	294	West Germany 100; Belgium-Luxembourg 92; United Kingdom 29; France 28; Yugoslavia 10.
Scrap	5,105	544	United Kingdom 352; undisclosed 192.
Lead:			
Ore and concentrate	5,090	4,271	Algeria 3,334; Morocco 902.
Metal	[r] 1,750	504	West Germany 147; United Kingdom 116; Belgium-Luxembourg 78; Denmark 71.
Semimanufactures	88	188	Belgium-Luxembourg 109; Netherlands 61.
Manganese, ore and concentrate	----------	1,643	India 1,643.
Nickel, semimanufactures	59	40	United Kingdom 20; West Germany 20.
Tin:			
Metal long tons	260	242	Netherlands 114; Federation of Malaya 101; United Kingdom 15.
Semimanufactures do	----------	6	West Germany 5.
Zinc:			
Metal	5,344	4,985	Belgium-Luxembourg 2,726; Federation of Rhodesia and Nyasaland 1,319; West Germany 720.
Semimanufactures	[r] 257	360	Poland 247; West Germany 45; Yugoslavia 34.
Scrap	----------	102	Belgium-Luxembourg 101.
Nonmetals:			
Asbestos, raw	3,386	2,815	Federation of Rhodesia and Nyasaland 867; Canada 836; Republic of South Africa 631; France 297.
Barite, crude	----------	311	United States 311.
Cement	2,481	1,831	Denmark 1,046; France 383.
Clays	1,942	5,151	United Kingdom 1,609; Czechoslovakia 1,008; West Germany 850.
Graphite	244	261	West Germany 113.
Fertilizers:			
Nitrogenous	279,022	370,306	Italy 114,909; West Germany 60,152; Austria 50,273; France 37,761; East Germany 30,446.
Phosphatic	74,962	81,617	Belgium-Luxembourg 26,632; Italy 18,647; Tunisia 12,012; France 11,106; Poland 10,111.
Infusorial earth	----------	152	Italy 114.
Magnesite	306	254	Austria 123; United Kingdom 23.
Mica	----------	23	India 3; undisclosed 20.
Refractories:			
Bricks	18,833	9,353	United Kingdom 4,357; West Germany 2,403; Austria 1,376; Canada 324; Yugoslavia 290.
Cement and mortar	926	497	United Kingdom 286; West Germany 119.
Phosphate rock	147,970	204,066	Morocco 135,125; Tunisia 68,941.
Potash	[r] 1,499	1,570	West Germany 1,570.
Stone, sand and gravel	28,503	17,964	Belgium-Luxembourg 15,109; Netherlands 1,600.
Sulfur	[r] 7,300	20,473	France, 20, 473.

[r] Revised.

Table 3.—Greece: Imports of selected metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Mineral fuels:			
Coal and briquets	182,162	171,753	Poland 53,011; United States 51,154; U.S.S.R. 45,912.
Coke	31,311	110,626	West Germany 73,389; Italy 13,363; United Kingdom 10,473; U.S.S.R. 9,278.
Petroleum:			
Crude thousand tons	1,460	2,163	Saudi Arabia 1,314; U.S.S.R. 536; Iran 313.
Refinery products:			
Gasoline	27,372	16,435	Netherlands Antilles 4,097; United States 3,821; United Kingdom 3,145; Rumania 2,637; Iran 1,661.
White spirit, kerosine	4,096	1,974	Netherlands Antilles 1,146; Aden 253.
Distillate fuels	212,783	305,609	Rumania 84,549; U.S.S.R. 68,972; Aden 43,482; United States 36,701.
Residual fuel oils thousand tons	853	1,103	U.S.S.R. 412; Egypt 277; Kuwait 143; Rumania 110; United States 31.
Lubricants	23,797	27,491	United States 11,734; Netherlands 6,819; Belgium-Luxembourg 3,950; United Kingdom 2,013.

COMMODITY REVIEW

METALS

Aluminum.—During 1964 the construction of the first Greek aluminum plant continued at Distomon near Itea. The plant, with a planned capacity of 200,000 tons of alumina and 62,000 tons of aluminum, was to be completed in 1965. The construction site is connected by a first-class asphalt road with the main highway between Athens and Levadia. The mines that will provide the bauxite for the plant are nearby.

The plant site, in an isolated region several kilometers from the town of Distomon, is at about the midpoint of the northern shore of the Gulf of Corinth, where facilities for oceangoing ships up to 35,000 tons have been constructed. This port permits delivery of plant goods by sea.

In addition to standard components of an aluminum plant, facilities for production of carbon anodes will be incorporated. Electrical power for smelting approximately 1 billion killowatt hours annually will be supplied by the national grid. Until completion of the hydropower plant at Kremasta, power shortages may restrict production of the plant. To provide adequate quantities of water for plant operation (about 2.5 billion cubic meters per year) several dozens of water wells have been drilled on the plant site; the possibilities of desalting sea water were explored, but estimated cost was high and the idea was abandoned. During 1964, in addition to industrial facilities, the company was constructing housing development for the laborers of the company near the plant site.

The company Aluminion Ellados (the Aluminum Co. of Greece) was formed by Pechiney, of France, with controlling share; Industrial Development Corp. (I.D.C.), held partly by Greek State; Reynolds International, a subsidiary of U.S.-based Reynolds Metals Co.; and by several other investors.

A labor force of 800 workers will be adequate to operate the highly automated plant. The number of foreign workers at the plant initially will be limited to 8 percent of the 800 and, within 5 years, will be reduced to 3 percent of the total.

Out of total planned annual alumina production, 80,000 tons is scheduled to be exported, and of total aluminum output, approximately 50,000 tons is for export: It is expected that domestic markets will absorb 12,000 tons of aluminum annually.

Domestic aluminum production will reduce exports of bauxite, the largest mineral export item of Greece in 1964. An agreement with the French firm, Pechiney, Compagnie de Produits Chemiques et Electrometallurgiques, imposed a ceiling for bauxite export at 1 million tons in order to assure an adequate supply for the new plant. During 1964 most of the Greek bauxite was produced from operations south of Mount Parnassos, on Euboea Island, and in the Chalkidiki area. In these areas, intensive exploration and development were conducted to prove large new reserves of bauxite. Limitation on bauxite export reportedly may be lifted when reserves totaling 30 million tons of bauxite are established.

Chromite.—Chromite output was about the same as in 1963 partly as a result of continued low prices stemming from oversupply of the commodity on world markets.

Copper.—Exploration of promising copper ore deposits in Chalkidiki were completed during 1964. Reports indicate reserves of 30 million tons averaging 0.8 percent of copper and 2 grams of gold per ton of ore. Because of difficulties over foreign exchange, the Nippon Mining Co. Ltd. of Japan, who explored the deposit, abandoned plans for construction of the beneficiation plant. At yearend, negotiations were underway for construction of a beneficiation plant with a Canadian group.

Iron and Steel.—Construction of the iron-and-steel plant near Salonica continued during 1964. The Pappas-Esso group, which is the investor, expected that the production of cold-rolled products will start in the fall of 1965. The iron ore for the plant should be supplied from domestic mines.

Lead and Zinc.—Greek production of zinc concentrate again was entirely for export, while lead concentrate output was in part exported and in part smelted indigenously. Most of the metal so produced was consumed in the country, but this supply was not sufficient to meet the country's requirements. During 1964, principal Greek lead and zinc producers were again the mines at Larumium southeast of Athens and the facilities near Cassandra in eastern Chalkidiki.

Manganese.—The reported discovery of a manganese deposit by the Soviet oceanographic expedition at the island Chira proved to be without economic significance. After the Soviet announcement, the Greek Institute for Geology reexamined the already known deposits. Results indicated low-grade material of no commercial value.

Nickel.—The nickel smelter under construction at Larymna in 1964, was scheduled to start production in early 1965. The facility, owned by the Larco Co., jointly controlled by French and Greek capital, was expected to start production of refined nickel also in the spring of 1965. Reports indicate that the plant will have a capacity of 4,000 tons of electrolytic nickel per year.

NONMETALS

Cement.—Cement remained one of Greece's most important mineral products. Production totaled 2.7 million tons, an increase over that of 1963 by 16 percent. No new capacity was added during 1964. However, financial means for expanding cement plant at Eleusis was granted by Ellenic Investment Bank and final Government-of-Greece approval was granted for American Cement Co. to establish a $10 million cement plant at Patras, indicating a further development of this important branch of the mineral industry.

MINERAL FUELS

Lignite and Coal.—Most of Greece's energy requirements were covered by domestic lignite production during 1964. However, some importation of high-rank coals and coke mostly from U.S.S.R. was necessary.

Production of lignite in 1964 was 9.3 percent greater than in 1963. About 70 percent of total output originated in the Ptolemais region, southwest of Salonica.

Because of rising energy requirements in Greece, the State-owned Public Power Corporation started prospecting large lignite deposits in different parts of the country, but results were not reported. Any significant find could serve as a fuel source for thermal-power generation by a plant built at or near the mine.

Petroleum.—The Greek Government had several arrangements for oil prospecting with foreign drilling operators, namely the Italian Government-owned Ente Nazionale Idrocarburi (ENI) and the French private company, Forenco. All drilling operations during 1964 resulted in dry holes; thus Greece remained without crude oil production.

During 1964 the Greek Government decided to proceed with the expansion of its Aspro Pyrgos oil refinery. After termination of the existing lease contract in 1968, this refinery will continue to operate as a Government enterprise. Construction of the Pappas-Esso oil refinery in Thesaloniki was progressing on schedule. Erection of storage facilities was underway toward the end of 1964. Crude oil for refinery operation was imported from various Middle East oilfields.

The Mineral Industry of Hungary

By Roman V. Sondermayer[1]

◆

HUNGARY did not produce a great variety of mineral products during 1964, and only bauxite and alumina were of world consequence. Coal was important from the domestic viewpoint. Hungarian bauxite output was about 4.5 percent of total world production; output of other more important products—aluminum, cement, coal, pig iron, manganese ore, and steel ingots—ranged between 0.5 and 1.8 percent of world totals. Mineral consumption was much larger than production, and substantial imports were needed.

The contribution of the mineral industry to the gross national product was about 6 percent, about the same as in 1963. One-eighth of total labor force, or 160,000 persons, were employed by the mineral industry during 1964. Mineral imports, chiefly of raw materials, remained vital to the country's industry, while its bauxite and semimanufactured mineral-product exports were almost essential as sources of foreign exchange.

Major developments during 1964 included discovery of bauxite deposits in western Hungary estimated to contain more than 30 million tons of ore; expansion of an aluminum plant at Almafuzito; construction of a new aluminum plant at Ajka; and construction of a new iron-ore dressing plant near Miskolc.

Principal events in the nonmetallic mineral industry were completion of reconstruction of the Labalatan cement plant and the commissioning of a 350,000-ton-per-year nitrogenous-fertilizer plant at Tiszapalkonya. The coal industry announced development of a brown-coal deposit at Nograd and a new lignite deposit near Gyongyos.

A new gas and oilfield was discovered in the general area of the Zala fields, and Hungary's first reforming plant was under construction at the Szony refinery.

PRODUCTION

Hungary's most valuable mineral product from the domestic viewpoint, continued to be coal, mostly brown coal. Output, including lignite, exceeded that of 1963 by 1 million tons. Underground mining methods prevailed. Because of inadequate mechanization, productivity was low as measured by West European standards. Production of bauxite, Hungary's most important export mineral, increased by about 9 percent in 1964. Output was almost entirely from opencast mines. Many sectors of the mining and metallurgical industry were modernized with Soviet equipment and design but results were less satisfactory than expected and a tendency was noted in Hungary for increasing purchases of equipment in the West.

---

[1] Foreign mineral specialist, Division of International Activities.

TABLE 1.—Hungary: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity[1]	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Bauxite	1,189,913	1,366,053	1,473,170	1,362,000	1,488,000
Alumina	217,998	224,445	233,000	239,000	246,000
Metals:					
Unalloyed ingot	49,534	51,062	52,732	55,498	56,874
Unalloyed semimanufactures	13,504	15,346	[e]16,000	[e]16,500	[e]16,500
Alloyed semimanufactures	3,433	4,343	[e]5,000	[e]5,000	[e]5,000
Iron and steel:					
Iron ore thousand tons	516	605	682	733	775
Pig iron do	1,246	1,306	1,382	1,388	1,494
Steel ingot do	1,885	2,053	2,333	2,374	[r]2,374
Rolled products do	1,234	1,449	1,610	1,688	1,673
Manganese ore	123,276	124,838	129,226	152,371	[e]152,000
Nonmetals:					
Cement thousand tons	1,571	1,601	[r]1,733	1,800	2,257
Fertilizers:					
Nitrogenous; gross weight	278,087	330,083	353,000	387,000	447,993
Phosphatic; gross weight	270,087	331,188	429,068	512,864	539,293
Kaolin	NA	NA	40,818	44,234	[e]45,000
Lime, calcined	583,658	612,818	621,166	621,656	732,131
Sulfur, elemental	3,186	3,460	NA	NA	NA
Mineral fuels:					
Coal:					
Lignite thousand tons	4,230	4,717	4,662	4,831	5,060
Brown do	19,447	20,389	20,648	21,932	22,363
Bituminous do	2,847	3,071	3,343	3,711	4,125
Briquets do	1,050	1,123	1,188	1,200	[e]1,250
Coke do	499	597	654	660	665
Gas, natural million cubic feet	[r]12,078	[r]11,419	[r]12,005	[r]21,598	29,250
Petroleum:					
Crude thousand tons	1,217	1,457	1,641	1,756	1,801
Refinery products:					
Gasoline	329	338	343	333	370
Diesel oil	731	793	859	861	970
Heating	988	1,140	1,282	1,403	1,643
Lubricants	NA	NA	101	[e]120	NA

[e] Estimate. NA Not available. [r] Revised.

[1] In addition to reported commodities Hungary is known to produce (figures where given represent 1964 production estimates) asphalt, 390,000 metric tons; bentonite, 115,000 metric tons; dolomite, 440,000 metric tons; quartzite, 36,000 metric tons; peat, 60,000; and also arsenic, copper, gold, uranium, china clay, and diatomite.

Source: Kosponti Statisztikai Hivatal (Office of Statistical Council). Statisztikai Evkonyy (Statistical Yearbook). Budapest, 1964, 235 pp.

TRADE

During 1964 there were no major changes in the pattern of Hungarian foreign trade. The country imported most of its mineral raw materials, with bauxite, manganese ore, and cement as the major exceptions. The country depended heavily on imported high-rank coals, iron ore, petroleum, and nonferrous base metals. Most of the foreign trade in minerals and other commodities was with other Communist countries, usually members of the Soviet Ekonomicheskoy Vzayimopomoshchi (SEV).[2] Hungary's most important trading partner was the U.S.S.R., which supplied the bulk of Hungary's raw-material imports and obtained small quantities of semimanufactured products.

TABLE 2.—Hungary: Export of selected metals and minerals[1]

(Metric tons unless otherwise specified)

Commodity	Total[2]		To U.S.S.R.[3]	
	1962	1963	1962	1963
Metals:				
Aluminum:				
Bauxite____thousand tons__	719	667	(4)	(4)
Alumina____do____	126	134	(4)	(4)
Metal, ingot____	5,983	9,315	-----	-----
Iron and steel, rolled products____	510,000	525,000	7,600	200
Mineral fuels:				
Petroleum refinery products:				
Gasoline____thousand tons__	118	82	[5] 29	[5] 30
Diesel fuel____do____	196	162		
Heating oil____do____	263	281		
Other____do____	NA	NA		

NA Not available.

[1] Destinations are not reported.

[2] Statisztikai Havi Kozlemenyek (Monthly Statistical Statement), Budapest, No. 6, 1964, 104 pp.

[3] Vneshnyaya Torgovlya S.S.S.R. za 1963 god (Foreign Trade of the U.S.S.R. for 1963). Moscow, 1964 264 pp.

[4] None reported; long-term trade agreements call for annual export of 330,000 tons of alumina to the U.S.S.R. in exchange for 165,000 tons of aluminum.

[5] In 1962 includes lubricants 13, other 16; in 1963 includes lubricants 13, other 17.

TABLE 3.—Hungary: Officially reported import of selected metals and minerals[1]

(Thousand metric tons)

Commodity	1962	1963
Metals:		
Iron and steel:		
Iron ore____	2,243	2,351
Rolled steel____	219	197
Mineral fuels:		
Bituminous coal____	1,712	2,513
Coke____	910	1,018
Petroleum:		
Crude____	1,540	1,828
Refinery products; heating oil____	67	135

[1] Origin of imports not reported.

Source: Statisztikai Havi Kozlemenyek (Monthly Statistical Statement), Budapest, No. 6, 1964, 104 pp.

---

[2] Council for Economic Mutual Aid set up under an international agreement that includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Rumania, and the U.S.S.R.

TABLE 4.—Hungary: Imports of selected metals and minerals from the U.S.S.R.

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:		
Cadmium	100	120
Chromite	14,000	16,000
Copper	8,400	6,700
Iron and steel:		
Iron ore ... thousand tons	1,999	2,032
Pig iron	94,800	69,300
Ferroalloys	17,200	21,400
Steel:		
Rolled products except pipe	109,200	108,700
Pipe	8,900	3,900
Lead	8,500	10,000
Mercury ... 76-pound flasks	1,503	1,305
Nonmetals:		
Asbestos	10,100	12,400
Cryolite	1,000	------------
Fertilizer materials:		
Apatite concentrates	178,400	164,500
Potassic salts	26,400	24,600
Fire clay	600	1,600
Graphite	1,100	1,400
Sulfur	26,100	16,600
Mineral fuels:		
Bituminous coal ... thousand tons	297	326
Coke ... do	523	636
Petroleum:		
Crude ... do	1,521	1,496
Refinery products:		
Gasoline ... do	58	78
Diesel fuel ... do	80	240
Heating oil ... do	59	55
Lubricants ... do	12	11
Total ... do	209	384

Source: Vneshnyaya Torgovlya S.S.S.R. za 1963 god (Foreign Trade of the U.S.S.R. for 1963). Moscow, 1964, 264 pp.

COMMODITY REVIEW

METALS

Bauxite and Aluminum.—Hungary, one of Europe's leading bauxite producers and a modest producer of aluminum, continued efforts to develop its aluminum industry during 1964. An investment program of about $6 million was used mainly for development of bauxite mines and production of alumina. Further expansion of aluminum-metal production was postponed because of power shortage from existing plants and lack of funds for investments in new electric plants.

Intensive exploration for bauxite was conducted during 1964. Approximately 100,000 linear meters of exploratory holes were drilled. Reports indicate that deposits discovered in the western part of the country contained about 30 million tons of ore.

A new small bauxite mine started operation on the outskirts of Kislod in Veszprem Magye. This mine was to deliver 60,000 tons of bauxite annually. Several new bauxite mines were under development in the area near Iszkaszentgyorgy and Kincsebanya, the region which produces one-third of the present national output. When completed the new mines will increase the output of the area by 700,000 tons annually. Plans call for expansion programs to be completed in 1970.

The Almasfuzito alumina plant, with an annual capacity of 120,000 tons, was being modernized and enlarged during 1964 to increase capacity to 280,000 tons per year. Completion was scheduled for the spring of 1970. The construction of a new alumina plant at Ajka, with a final annual production of 500,000 tons, was progressing according to plans. The first stage will start production in 1972. In both plants partial automation will be introduced.

Only about 50 percent of Hungary's alumina production of 246,000 tons was turned into primary aluminum in Hungarian reduction plants. The alumina was shipped to the U.S.S.R. where it was processed into primary aluminum. No drastic changes are foreseen in this pattern in the near future. Plans call for aluminum-production capacity to be increased to only 80,000 tons by 1980, with the rest of the alumina produced to be shipped to the U.S.S.R. The aluminum agreement between the U.S.S.R. and Hungary calls for an ultimate shipment of 330,000 tons of alumina per year to the U.S.S.R. for which Hungary is to receive 165,000 tons of aluminum ingots annually.

Iron and Steel.—Although the production of iron ore in Hungary was by 44,000 tons higher than in 1963 and totaled over three-quarter million tons, imports still supplied over two-thirds of the total domestic consumption of 3 million tons. The largest domestic mine, Ruda Banya, which produced 75 percent of Hungary's output in 1964, underwent modernization involving a change of mining methods. Introduction of the large-room mining method resulted in higher productivity and lower production costs. As the ore produced averaged only about 40 percent iron, a new ore-dressing plant was under construction near Miskolc in the northeastern part of Hungary. The plant's planned input capacity was 10,000 tons of ore daily. Partial production by the plant was scheduled for mid-1966.

Steel production was adequate to cover the domestic needs in raw steel. Import of rolled products was still required because of inadequate capacity of rolling mills. In Dunajvaros, the center of steel production, the construction of the cold-rolling mill, which started in 1959, continued. When completed, the plant capacity will be 256,000 tons of cold-rolled sheets annually.

NONMETALS

By world standards the Hungarian nonmetals industry is small and insignificant, but its 1964 production was adequate to cover the domestic needs for cement, lime, clays, and other construction materials. Asbestos, graphite, raw material for fertilizers, and high quality refractories had to be imported because of lack of natural resources and facilities for their production.

Cement and Lime.—The cement industry, with an annual production of over 2 million tons, underwent reorganization. The 10 enterprises that operated previously were merged into one nationwide organization under direct supervision of the Ministry of Construction.

The expansion program of the Lablatan Cement and Lime Works, started in 1952, was completed; annual capacity of the plant was raised to 520,000 tons of cement and 120,000 tons of lime. A new limestone quarry was put in operation in Felnemet. According to reports, annual capacity was 700,000 tons.

Fertilizers.—Production of phosphatic and potassic fertilizers continued to depend on imported raw materials. Favorable conditions for the production of nitrogenous fertilizers, including the presence of significant natural gas reserves, made the efforts for expansion more realistic. In addition to two operating plants, one in Petfurde and the other at Kazinebarcika, Hungary's third installation at Tiszapalkonya started test production in the fall of 1964. Planned capacity of this plant was 350,000 tons of nitrogenous fertilizers with an average nitrogen content of 34 percent.

MINERAL FUELS

The overall mineral-fuel supply situation remained unsatisfactory from the viewpoint of the Government. The lack of high-grade coals was somewhat compensated by gas production and petroleum output, but most of the requirements for good-quality fuels had to be met through imports. Governmental efforts were concentrated on development of facilities to upgrade the mineral fuels produced in the country. Coals have been the principal source of primary energy in the country although natural gas was emerging as a strong competitor.

Coal.—Production of all kinds of coals increased and totaled 31.5 million tons in 1964; of this total about 70 percent was brown coal, 13 percent was bituminous, and 17 percent was lignite. Production gains were achieved in spite of a variety of difficulties. In the first quarter of 1964, production was hampered by severe winter weather. During the second quarter, flooding of the mines at Tatahanya, Balnika, Ebszoeny, Padrag, and Jokai caused a significant loss of output. A fire in mine No. 3 at Komlo and a shortage of labor were the main reasons for the low output of this mine. To fulfill planned targets, miners had to work overtime on Sundays and on other days.

Following exploration, work started on the development of a brown-coal deposit at Nograd in northern Hungary. The reserve was reported to be 25 million tons of coal with an average calorific value of 3,400 to 3,600 calories per kilogram. Another discovery was announced in the Gyongyos-Naguerde area. The deposit, containing 17 million tons of lignite with a calorific value of 1,600 to 1,800 calories per kilogram, is shallow and favorable for strip mining. The opening of the Visonta opencast mine in the same area is tied up with the construction of the Gyongyos thermal power station. The first unit of that plant will start operation in 1968.

Petroleum and Natural Gas.—Hungary's crude output of 1.8 million tons was from two major fields, Lovasy and Nagyenguel, and more than 40 very small fields. The Nagyenguel field contributed 70 percent of the country's total output in 1964. Import of 1.8 million tons of crude from the U.S.S.R. fulfills the rest of the domestic demand. New discoveries of oil and gas were announced in the Zala oilfield area. Information on depth of producing formation and reserves was withheld. The present rate of production was maintained mostly by development drilling for expansion of existing fields as well as by increased secondary recovery and fracturing. To further production, the Hungarian petroleum industry prepared to explore formations that are deeper than 3,500 meters.

During 1964 at the Szony refinery, construction was begun on Hungary's first reforming plant, scheduled for operation in fall of 1965. Equipment for this plant was to be imported from the Netherlands.

Production of natural gas totaled 29,250 million cubic feet, about 33 percent more than in 1963 and nearly 2½ times the output of 1962. In view of the country's apparent lack of high-grade coal and petroleum resources, the future of natural-gas consumption is bright.

The Government's planning office planned to construct a unified gas-pipeline network. During 1965 all important manufacturing enterprises in the Budapest industrial area are expected to be fueled by natural gas.

In the general area of the Great Plains near Kiskunsag, drilling led to the discovery of a gas and oilfield. Preliminary well tests gave a calculated daily production level of 630,000 cubic feet of gas, together with 2,300 barrels of oil condensate based on drill-stem tests. The extent of the field was not yet determined, and the depths of producing formations were not reported. A plant to produce liquefied propane-butane gas was commissioned at Szony. Capacity was reported to be 3,000 tons of liquefied gas annually. Construction of a similar plant at Hajduszobszlo was reported to be progressing according to plans, with the facility scheduled to start production during the second half of 1965. Capacity of this second plant was expected to be 50,000 tons per year.

The Mineral Industry of Ireland

By Stephen C. Brown[1]

◆

IN 1964, for the second year in a row, the Irish economy grew at the rate of about 4 to 4.5 percent. Although complete statistical data are not available, the evidence tends to indicate that the mineral industries maintained their relative position in the economy, due chiefly to the continuing growth of the mineral processing sector, consisting of the cement, fertilizer, and petroleum refining industries. The small iron and steel industry also is believed to have increased its output.

Nevertheless, the Irish mineral industry remained very small, both in terms of national output as a whole and in terms of world supply and demand; according to census data for 1962 (the latest available) the mining and quarrying industries accounted for only 1.2 percent of gross domestic output for that year, and inclusion of the mineral processing sector (for which detailed census figures are not available) would probably not raise the proportion much above 2 percent. Foreign trade in minerals increased in both 1963 and 1964.

Meanwhile, cement industry capacity was enlarged in 1964, and an expansion of the country's small steel industry was underway. Plans for expansion of the country's only petroleum refinery were announced in early 1965. Development of the lead-zinc-silver deposits discovered in 1962 continued, and explorations for other nonferrous metals were reported to have shown promising results.

GOVERNMENT POLICIES AND PROGRAMS

No significant changes occurred in government policies with respect to minerals during the year. Protective tariffs on industrial products were reduced by 10 percent across the board effective January 1, 1964; this affected some mineral products. Some quotas on imports were increased by 10 percent at the same time; superphosphates was the only mineral item affected by the increase of quotas. The suspension of duties on certain iron and steel semimanufactures (bars, rods, angles, shapes, sections, sheets, and plates) was continued. The Government advertised for tenders for its interest in the Avoca copper mine, in which it had invested an estimated $5.6 million. The mine was closed in 1962 due to the poor grade of ore.

---

[1] International economist, Division of International Activities.

PRODUCTION

Estimates of output for 1964 show substantial increases over 1963 production for barite, cement, refractory clay, gypsum, coal, peat, and refinery petroleum products. Estimates are not available for 1964 fertilizer output. For the second year in a row, no nonferrous metals or iron pyrites were produced.

TABLE 1.—Ireland: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963 [e]	1964 [e]
Metals: [1]					
Copper, metal content of ore	6,244	5,928	[r] 2,388	---	---
Lead, metal content of ore	1,343	253	---	---	---
Steel ingots and castings ... thousand tons	40	28	19	20	20
Zinc, metal content of ore	1,249	167	---	---	---
Nonmetals:					
Barite	10,618	4,227	[r] 20	9,246	62,259
Cement ... thousand tons	745	744	760	802	973
Clays, refractory	15,936	16,174	18,096	17,804	21,289
Construction materials: [2]					
Sand and gravel ... thousand tons	1,159	1,330	1,637	1,616	1,881
Limestone ... do	1,871	[3] 913	[3] 1,363	2,356	1,611
Gypsum ... do	181	167	[r] 176	199	228
Lime ... do	29	29	166	35	43
Pyrites, including cupriferous ... do	22	51	38	---	---
Superphosphate ... do	233	[r] [4] 593	[r] [4] 655	320	NA
Other ... do	922	1,296	[r] 1,656	1,497	2,020
Mineral fuels:					
Coal:					
Anthracite ... do	130	[r] 136	[r] 132	131	145
Semibituminous ... do	77	[r] 72	76	78	[e] 86
Coke, gas plant, including coke breeze ... do	113	123	[3] 122	[r] [3] 128	NA
Peat:					
Briquets ... do	124	211	[r] 241	[r] 293	287
Milled, excluding briquets ... do	194	676	[r] 1,163	[r] 1,606	2,142
Sod ... do	2,960	[r] 2,873	[r] 2,803	2,694	2,486
Moss ... do	13	19	22	23	19
Petroleum refinery products:					
Gasoline ... thousand 42-gallon barrels	2,495	2,630	2,784	2,895	3,278
Jet fuel ... do	58	47	---	---	---
Kerosine ... do	215	66	73	1	---
Distillate fuel oil ... do	3,104	3,281	3,412	3,590	3,911
Residual fuel oil ... do	4,121	4,022	4,364	4,462	5,076
Other ... do	82	170	137	345	277
Refinery fuel (including losses) ... do	824	678	659	704	692

[e] Estimate. [r] Revised. NA Not available.

[1] Small quantities of secondary lead and zinc, including alloys, were produced, but output is not definitely known.

[2] Does not include large quantities of stone, sand, gravel, and other materials used by government agencies for road maintenance.

[3] Data from census of production.

[4] Data from census of production; includes "other compound manures."

TRADE

Mineral imports in 1962, valued at $132.2 million, were 17.2 percent of total imports; mineral exports (including reexports) in that year were valued at $20 million, or 4 percent of total exports. Mineral imports increased by 10 percent in 1963, to $145.7 million, but remained at 17 percent of total imports; mineral exports (including reexports) increased by 11 percent, to $22.1 million, equal to 4.5 percent of total exports. On the import side the chief items in both 1962 and 1963 were crude petroleum and refined petroleum products (1962: $52.2 million; 1963: $52.8 million), iron and steel and semimanufactures (1962: $22.5 million; 1963: $24.8 million), coal and coke (1962: $22.5 million; 1963: $23.8 million), fertilizers and fertilizer raw materials (1962: $19.2 million; 1963: $22.4 million), and nonferrous metals and alloys (1962: $10.1 million; 1963: $12.7 million). On the export side in both years the principal items were refined petroleum products (1962: $9.5 million; 1963: $11.4 million) and cement (1962: $2.7 million; 1963: $2.3 million). A substantial portion of the refined petroleum products consisted of reexports. Still relatively unimportant in value, but apparently growing, are exports of iron and steel and semimanufactures, and exports of unwrought and semimanufactured nonferrous metals, chiefly aluminum.

Preliminary trade data for 1964 show continued growth in imports of crude petroleum and refined products, iron and steel and semimanufactures, and nonferrous metals; a part of the increase in value of the latter was due to price increases. Of the exports (including reexports), the principal items to increase were cement, iron and steel and semimanufactures, and unwrought and semimanufactured nonferrous metals (apparently mainly aluminum). Exports and reexports of refined petroleum products declined.

TABLE 2.—Ireland: Exports[1] of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1963
Metals:				
Copper:				
Ore and concentrate	15,190	----------	----------	
Scrap:				
Unalloyed	1,282	1,820	1,956	Netherlands 924; Spain 457; United Kingdom 349.
Alloyed	657	910	809	United Kingdom 596.
Iron and steel:				
Iron ore and concentrate	12,778	1,665	NA	All to United Kingdom.
Metal:				
Scrap	14,454	26,450	45,595	Sweden 7,883; Italy 6,309; United Kingdom 341.
Unwrought and semimanufactures.	[2] 3,092	10,829	26,042	Mainly to United Kingdom.
Nonferrous metals, not elsewhere specified:				
Ores and concentrates	----------	----------	6,290	
Scrap	3,138	2,076	2,103	United Kingdom 984.
Unwrought and semimanufactures.	NA	[3] 1,386	[3] 4,403	Mainly to United Kingdom.
Nonmetals:				
Barite, plasters, limestone, flux, etc.	NA	14,682	32,447	United Kingdom 4,656.
Cement	236,978	189,616	251,131	United Kingdom 147,603.
Gypsum	86,630	NA	NA	
Fertilizers	7,649	7,551	9,088	All to United Kingdom.
Stone, industrial	87,987	NA	NA	
Other	178,610	278,137	276,872	United Kingdom 189,616.
Mineral fuels:				
Coal and coke	40,549	[4] 15,014	42,404	Netherlands 9,088; United Kingdom 484.
Peat	38,179	21,007	16,754	United Kingdom 20,805.
Peat moss	16,747	20,329	20,478	United Kingdom 16,682.
Peat briguets and coke	NA	64,988	NA	Norway 38,577; United Kingdom 26,345.
Petroleum refinery products:				
Gasoline. thousand 42-gallon barrels	[r] 373	238	200	All to United Kingdom.
Kerosine do	[r] 573	588	721	NA.
Distillate fuel oil do	988	1,054	998	All to United Kingdom.
Residual fuel oil do	[r] 764	----------	145	
Lubricating oils do	17	21	28	All to United Kingdom.

[r] Revised. NA Not available.

[1] Including reexports.

[2] Partial figure; includes bars, rods, shapes, angles, and sections.

[3] Partial figure.

[4] Coal only.

TABLE 3.—Ireland: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Metals:				
Aluminum and alloys:				
Unwrought	4,976	5,459	8,954	Canada 4,121; United Kingdom 536; United States 440.
Semimanufactures	3,129	3,257	3,956	United Kingdom 2,207; West Germany 416; Belgium 236; United States 216.
Copper and alloys:				
Unwrought	200	128	100	United Kingdom 113.
Semimanufactures	4,408	5,431	7,057	United Kingdom 4,624.
Iron and steel:				
Iron ore and scrap	289	[1] NA	[1] NA	
Pig iron and sponge iron	3,408	[2] 9,193	[2] 28,559	U.S.S.R. 4,118; United Kingdom 1,905; East Germany 1,880.
Other unwrought	9,998	[3] 115	[3] 175	NA.
Semimanufactures	143,879	164,442	174,620	United Kingdom 95,728; West Germany 20,748; Belgium 12,030.
Lead and alloys, all forms	546	712	427	United Kingdom 698.
Tin and alloys, all forms—long tons—	45	51	65	Mainly from United Kingdom.
Zinc and alloys:				
Unwrought	2,773	2,776	3,474	Belgium 1,616; United Kingdom 663.
Semimanufactures	145	166	294	United Kingdom 117.
Nonferrous metals, not further identified:				
Ores and scrap	314	[4] NA	[4] NA	United Kingdom (quantity not reported).
Metal, unwrought and semimanufactures.	259	317	256	United Kingdom 290.
Nonmetals:				
Asphalt and bitumen, natural	----------	----------	3,249	
Asbestos	2,941	----------	3,270	
Borax	1,127	1,325	1,052	NA.
Cement	5,825	6,929	6,725	United Kingdom 6,417.
Clay, refractory	9,234	NA	NA	
Clay, construction	5,289	6,898	5,204	United Kingdom 5,415.
Fertilizers:				
Nitrogenous	128,657	169,624	160,711	West Germany 47,761; Netherlands 38,991; Belgium 29,524; East Germany 27,856.
Phosphatic:				
Phosphate rock	225,366	230,577	239,484	All from Morocco.
Basic slag	123,326	123,477	158,076	Mainly from Belgium.
Other	19,452	29,538	24,942	Do.
Potassic	145,016	160,756	157,256	France 63,864; West Germany 48,105; East Germany 28,184; United States 15,736.
Other	10,059	10,826	5,730	NA.
Pyrites, iron, unroasted	2,680	1,403	3,109	NA.
Refractory materials	10,039	10,647	9,970	United Kingdom 8,712.
Sand	31,878	37,485	38,568	Belgium 27,947; United Kingdom 7,956.
Salt	41,896	40,033	37,890	United Kingdom 32,271; West Germany 3,268.
Stone:				
Dimension	1,551	581	649	United Kingdom 460.
Crushed	19,873	NA	NA	
Sulfur	46,808	47,598	54,661	United States 43,410; United Kingdom 314.
Other	NA	93,193	NA	NA.

See footnotes at end of table.

TABLE 3.—Ireland: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Mineral fuels:				
Coal:				
Anthracite______thousand tons__	58	58	58	Mainly from United Kingdom.
Bituminous______________do____	1,430	1,400	1,254	United Kingdom 535; United States 427; Poland 293; West Germany 102.
Briquets of coal, coke and peat____thousand tons__	3	4	3	Mainly from United Kingdom.
Coke________________________do____	16	12	13	United Kingdom 11.
Petroleum:				
Crude or partly refined thousand 42-gallon barrels__	11,324	12,191	__________	Iraq 9,758; Saudi Arabia 1,690 Iran 743.
Refinery products:				
Gasoline____________do____	463	282	NA	NA.
Kerosine and jet fuel_do____	1,392	1,453		
Distillate fuel oil_____do____	70	69		
Residual fuel oil_____do____	1,330	1,726		
Lubricants__________do____	[r] 182	232		
Liquefied petroleum gases. do____	74	95		
Asphalt____________________	625	193		
Wax and petrolatum_______	17	22		

[r] Revised. NA Not available.

[1] Possibly included under "Other unwrought."

[2] Including ferroalloys and spiegeleisen.

[3] Partial figure; rough castings only.

[4] Quantity not reported; value was $92,708 in 1963 and $386,938 in 1964, compared to $52,623 for 314 tons in 1962. May also include iron ore and scrap in 1963 and 1964.

COMMODITY REVIEW

METALS

Aluminum.—Although production data are not available, apparently output of unwrought and semimanufactured aluminum increased significantly during 1964; preliminary export data show 1964 exports of 4,403 metric tons as compared with 1,386 tons in 1963.

Copper.—The Irish Government advertised for tenders for its interest in St. Patrick's Copper Mines' Avoca mine in County Wicklow, closed down in 1962. The Government had invested about $5.6 million. The property was said to include a mill with a 3,600-metric-ton daily capacity, apparently in good condition.

Gortdrum Mines (Ireland) Ltd., the wholly owned Irish subsidiary of Gortdrum Mines Ltd., a Canadian company, reported copper values of up to 2.99 percent copper, plus silver, in borings carried out near Limerick, about 30 miles southwest of the Silvermines' lead-zinc-silver finds.

Iron and Steel.—The state-controlled Irish Steel Holdings Ltd., reported in mid-1964 as operating at a rate of about 60,000 tons per year, was involved in a major modernization and expansion program during the year. Output was expected to reach the rate of about 90,000 tons per year by late 1965.

Lead-Zinc-Silver.—Progress was made by the Irish Base Metals Ltd. (a subsidiary of the Canadian firm Northgate Exploration Ltd.), in arranging finance for development of its Tynagh lead-zinc-silver deposit. A concentrator is planned at Tynagh, and the concentrate will be shipped through the port of Galway to smelting plants on the Continent under control of Société Generale des Minerais (Belgium), Metallgesellschaft A.G. (Germany), and Societe Miniere et Metallurgique de Penarroya (France), as well as to the British Metal Corporation. Operations were scheduled to begin in September 1965, and full operations were expected to be reached early in 1966, at the rate of about 150,000 tons per annum. Company estimates indicated reserves of 2.8 million tons of sulfide ore grading 8.66 percent lead, 7.36 percent zinc, and 2.93 ounces of silver plus 1.2 million tons of oxide ore grading 9.92 percent lead, 4.66 percent zinc, 1.32 percent copper, and 3.69 ounces of silver; deeper sulfide reserves were estimated at 3.76 million tons averaging 4.76 percent lead, 4.27 percent zinc, 0.6 percent copper, and 2.04 ounces of silver per ton. It was reported that the explorations of Consolidated Mogul Mines at Silvermines disclosed estimated ore reserves of over 11 million short tons, with values of 2.80 percent lead, 8.16 percent zinc, and 0.81 ounce of silver.

NONMETALS

Cement.—Both production and exports of cement increased substantially in 1964, as the expansion program of Cement Ltd., Ireland's principal producer, increased the company's capacity significantly. By the end of 1965, capacity is expected to reach the level of 1.2 million tons annually. About a quarter of its production has been exported.

Fertilizers.—The first unit (a sulfuric acid plant) of the nitrogenous fertilizer plant of Irish Nitrogen Ltd. (Nitrigin Eireann Teoranta) at Wicklow was due to be completed in early 1965. The fertilizer plant has been designed to have a capacity of 150,000 tons of nitrogen fertilizers per year and is expected to supply Ireland's full requirements for sulfate of ammonia and calcium ammonium nitrate. Plant design, construction, and equipment were supplied by a consortium of West German companies headed by Lurgi and Unde.

MINERAL FUELS

Petroleum Refinery Products.—In early 1965 plans were announced for expansion of capacity of the Irish Refining Company Ltd.'s Whitegate refinery at Cork. Capacity will be increased from 1.9 million tons to 2.5 million tons by early 1966; construction was scheduled to begin in the summer of 1965. Foster Wheeler Ltd. of London was reported to be the contractor. The cost of the expansion is estimated at $8.4 million.

Plans of the Electricity Supply Board to increase the capacity of its oil-fired generating plant at Ringsend, Dublin, and to build additional 120-megawatt oil-fired plants at Great Island, Wexford, and Tarbert, in County Kerry, indicated a growing demand for petroleum products in the future.

SOURCE MATERIALS

Production data are from Census of Industrial Production reports published in the official Irish Statistical Bulletin, from foreign service dispatches of the U.S. Department of State, and from various nonofficial sources. Trade data are from Trade Statistics of Ireland, compiled by the Central Statistics Office, Dublin. Information about particular commodities is from foreign service dispatches of the U.S. Department of State and from various trade publications. Irish trade statistics are compiled on the general trade system, with no distinction between imports for consumption and imports for reexportation; reexports are shown separately. For this reason export data shown in the trade tables include reexports, which however are significant only in the case of refined petroleum products.

The Mineral Industry of Italy

By F. L. Klinger[1]

◆

ITALY'S economic recession in 1964 did not appear to seriously affect the mineral industry. Although the increase of the gross national product (GNP), 2.7 percent, was the lowest since 1952 and also the lowest among countries of the European Economic Community (EEC), the gross output of the mining industry increased 6 percent in volume and 15 percent in value compared with 1963. With few important exceptions, production of mineral and metal commodities was near or above 1963 levels and Italy's relative position in world output remained about the same as in that year. The mineral industry also continued to increase productive capacity, particularly in aluminum, iron and steel, cement, and petroleum refining, and progress was made in reorganization of the lead, zinc, and sulfur industries. An anticipated but nevertheless historic event occurred in 1964 when Italy became a net importer of sulfur.

The economic recession was mainly reflected in minerals activities by substantial drops in domestic consumption of steel and copper, heavy layoffs in the construction industry, and reduced imports of metals. Increased exports of minerals and metals helped to maintain production in the face of reduced domestic consumption, notably in iron and steel. The reduced trade deficit in minerals and metals accounted for about one-third of the $1.2 billion reduction in Italy's overall trade deficit as compared with 1963 and contributed substantially to the surplus of $500 million in the nation's balance of payments for 1964.

Employment in the mineral industry (excluding petroleum refining, secondary metalworking, and construction materials other than marble) decreased by about 4,000 as compared with 1963. Half of this reduction occurred in the iron and steel industry, while 1,200 were displaced by cutbacks in sulfur production and another 400 were displaced in coal mining. Almost every branch of the extractive industry reduced employment to some extent during 1964.

GOVERNMENT POLICIES AND PROGRAMS

The Italian Government in 1964 took several measures to reduce inflationary pressures, to combat the recession, and to increase revenue. In February, restrictions were imposed on installment buying, the dividend withholding law was liberalized, and the gasoline tax was increased. A purchase tax also was levied on automobiles and pleasure boats but this was eliminated in November. In August, the turnover tax on most transactions was increased by 20 percent. Other measures were taken to stimulate exports and investments.

---

[1] Foreign mineral specialist, Division of International Activities.

A high Council of Mines was established in Rome to serve as an advisory body on legislation affecting mines and quarries. Council members were appointed by the President for a term of 3 years. Advisory functions on oil and gas will be handled by a special committee for hydrocarbons.

Under the 1948 Constitution, regulatory powers on mining were transferred to the three border regions of Aosta, Trentino-Alto Adige, and Friuli-Venezia Giulia, and to Sardinia and Sicily. Other regions on the Italian mainland will have regulatory powers only on quarries, peat deposits, and mineral waters.

It was also reported that $1.3 billion would be invested by State controlled companies in 1965, principally in energy sources (hydrocarbons), superhighway construction, and the development of southern Italy.

PRODUCTION

According to the Central Institute of Statistics in Rome, the index of production for the Italian extractive industry increased by 6.5 percent in 1964. Production indices for different branches of the industry showed increases of 1.5 percent in metallic ores and 15.2 percent in oil and gas but decreases of 2.4 percent in nonmetallics and 15 percent in solid fuels. The gross value of mineral production was $408 million, or less than 1 percent of GNP.

Principal gains in production volume compared with 1963 were shown in aluminum, potash, asbestos, crude petroleum, petroleum products, and natural gas. Mercury production rose less than 5 percent despite unusually high prices. Production of lead and zinc concentrates began to recover from the low levels reached in 1963 but output of primary metal was less. The declines in production of iron ore, bauxite, sulfur, and coal were continued in 1964.

TABLE 1.—Italy: Production of minerals and metals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Bauxite (54 percent Al_2O_3)	[r] 313,032	[r] 327,179	[r] 309,434	[r] 268,614	236,071
Alumina	222,186	231,057	225,227	238,726	262,675
Metal:					
Ingot:					
Primary	83,646	83,352	81,238	91,430	115,518
Secondary	42,000	45,000	56,000	65,000	58,000
Semimanufactures	83,000	90,000	97,000	107,000	NA
Antimony:					
Ore (13 to 18 percent Sb [1])	[r] 1,231	1,817	[r] 2,056	592	775
Regulus	449	[r] 484	[r] 345	[r] 451	406
Oxide	15	[r] 141	43	113	71
Sulfide	58	[r] 60	60	20	43
Arsenic ore (14 to 16.6 percent As)	3,759	3,750	1,622	----------	----------
Cadmium	294	[r] 348	[r] 249	[r] 280	271

See footnotes at end of table.

TABLE 1.—Italy: Production of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals—Continued					
Copper:					
Concentrate (21 to 23 percent Cu)	2,349	2,688	[r] 3,902	[r] 4,537	3,531
Cupriferous pyrite (about 2 percent Cu)	88,972	77,715	78,000	NA	NA
Sulfate	95,005	76,787	60,354	41,700	43,400
Metal:					
Unalloyed ingot:					
Primary (cement)	4,600	4,700	4,268	3,300	NA
Secondary (refined)	15,500	14,000	12,000	13,000	11,700
Alloys in ingots	27,700	33,000	31,500	29,500	NA
Semimanufactures, including alloys	233,900	275,000	294,000	323,000	293,000
Gold:					
Ore (0.007 to 0.01 percent Au)	1,411	246	---------	---------	---------
Metal troy ounces	[r] 2,765	[r] 675	---------	---------	---------
Iron and steel:					
Iron concentrates (47 to 51 percent Fe) thousand tons	[r] 1,262	[r] 1,236	1,151	1,006	914
Pyrite cinders do	NA	NA	[e] 924	[e] 888	[e] 900
Pig iron do	2,683	3,056	3,556	3,741	3,498
Ferroalloys do	141	145	122	127	127
Steel, ingot tons do	8,229	9,124	9,757	10,157	9,793
Semimanufactures:					
Hot rolled do	6,631	7,198	7,547	7,980	7,742
Cold rolled do	1,166	1,157	1,306	1,664	1,858
Lead:					
Concentrate (62 to 64 percent Pb)	[r] 79,282	[r] 75,986	[r] 67,695	[r] 50,671	52,319
Metal:					
Unalloyed, ingot:					
Primary	41,651	[r] 43,011	41,986	41,934	37,910
Secondary	NA	6,100	4,800	5,700	6,500
Alloyed ingot	10,000	14,000	12,000	14,000	NA
Semimanufactures	[r] 36,000	38,000	38,000	38,500	NA
Magnesium	[r] 5,447	[r] 5,617	[r] 5,704	[r] 5,527	6,028
Manganese ore (25 to 30 percent Mn)	[r] 49,497	[r] 49,166	[r] 44,421	45,287	47,783
Mercury:					
Ore	294,259	[r] 291,073	[r] 267,943	[r] 257,770	276,230
Metal 76-pound flasks	[r] 55,463	55,405	54,535	[r] 54,448	57,001
Nickel:					
Secondary	500	450	250	---------	NA
Semimanufactures, including alloys and anodes	440	350	300	300	NA
Silicon metal	18,240	19,000	15,550	17,000	NA
Silver thousand troy ounces [2]	944	973	930	1,006	1,061
Tin:					
Refined, unalloyed long tons	49	68	---------	---------	---------
Alloys:					
Solder do	3,444	3,740	4,035	4,035	NA
Babbitt do	886	1,673	492	1,083	NA
Titanium dioxide (90 to 100 percent TiO_2)	20,822	22,844	[r] 35,478	31,680	NA
Tungsten concentrates (65 percent WO_3)	7	2	1	2	1
Uranium ore	964	60	NA	NA	NA
Zinc:					
Concentrate:					
About 52 percent Zn	[r] 232,273	[r] 240,054	[r] 234,515	205,557	218,040
19 to 24 percent Zn	45,093	33,772	[r] 32,652	7,252	3,983
Meal:					
Ingot:					
Primary	79,869	78,403	[r] 77,667	73,596	72,644
Secondary	5,900	5,200	4,400	4,900	5,200
Semimanufactures	8,540	8,700	9,800	10,400	NA
Nonmetals:					
Asbestos	[r] 54,914	56,984	55,553	[r] 57,535	68,559
Asphalt rock, for surfacing	145,527	[r] 106,779	[r] 116,860	114,823	101,462
Barite	143,267	[r] 130,231	[r] 121,541	[r] 103,627	84,738
Boric acid from steam (about 96 percent in acid)	2,657	1,772	1,378	514	319
Bromine:					
Elemental	[e] 924	[r] 977	[r] 1,001	[r] 1,162	NA
Ethylene dibromide	354	536	532	753	NA
Celestite (90 percent $SrSO_4$)	830	1,070	600	654	457
Cement thousand tons	[r] 16,014	[r] 18,031	[r] 20,172	[r] 22,088	22,840
Clays:					
Bentonite	[r] 158,972	[r] 157,349	[r] 127,478	[r] 160,115	141,225
Bleaching	[r] 102,096	[r] 226,091	[r] 193,268	[r] 132,192	392,130
Refractory	[r] 121,925	[r] 134,739	[r] 178,450	[r] 193,514	
For bricks and terracotta thousand tons	18,752	[r] 22,942	24,642	NA	NA
For cement (including shale) do	2,338	[r] 2,493	2,837	NA	NA
Kaolin (crude)	[r] 64,035	[r] 87,388	[r] 96,981	[r] 99,000	63,751
Other	46,039	89,280	121,897	101,585	NA
Diatomite	47,072	57,198	56,589	NA	NA
Dolomite	489,744	650,862	704,734	NA	NA

See footnotes at end of table.

TABLE 1.—Italy: Production of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Nonmetals—Continued					
Earths:					
Coloring	9,104	[r] 6,758	6,662	NA	NA
Foundry	342,816	350,127	410,417	NA	NA
Feldspar (crude)	86,441	[r] 94,724	[r] 99,945	101,819	108,620
Fertilizer raw materials:					
Thomas slag (about 18 percent P_2O_5)	[r] 98,864	[r] 117,360	[r] 125,250	[r] 111,848	81,343
Potash salts (13 percent K_2O) thousand tons	332	908	1,038	1,264	1,470
Leucite (10 percent K_2O)	300	895	80	----------	----------
Fluorspar	162,347	156,564	[r] 160,308	124,495	124,034
Graphite	3,718	4,068	[r] 3,018	[r] 1,862	1,309
Gypsum (industrial) thousand tons	1,825	[r] 2,001	[r] 2,073	• 2,200	NA
Iodine (crude) kilograms	12,570	12,547	[r] 10,865	3,270	NA
Lime thousand tons	NA	5,200	5,355	• 5,700	• 5,100
Limestone:					
Cut and worked do	816	728	523	NA	NA
Other pieces (pezzame) do	[r] 9,416	8,438	7,795	NA	NA
For lime and cement do	[r] 19,371	[r] 19,130	21,678	• 22,000	NA
Marly, for hydraulic lime do	860	949	977	• 1,000	NA
Cement marl do	3,384	3,779	4,635	4,459	4,771
Quarry rubble do	15,382	[r] 13,871	16,459	NA	NA
Magnesite	5,973	6,784	8,414	6,815	6,309
Marble, white and colored, in blocks thousand tons	835	[r] 995	[r] 1,408	• 1,163	• 1,119
Pozzolan do	3,170	2,915	[r] 3,014	NA	NA
Pumice do	313	282	317	NA	NA
Pumice (lapilli) do	113	146	146	NA	NA
Pyrite (including cupriferous pyrite) do	1,546	1,580	1,585	[r] 1,408	1,397
Salt:					
Rock do	[r] 339	[r] 390	[r] 412	[r] 562	2,031
Marine do	[r] 995	[r] 1,192	[r] 1,203	[r] 1,326	
Sand and gravel do	25,632	[r] 28,877	[r] 34,680	• 35,000	NA
Silica sand do	1,903	2,097	2,404	NA	NA
Stone, other:					
Cut and worked do	2,427	2,479	• 2,500	NA	NA
Broken or crushed do	16,468	14,465	• 15,000	NA	NA
Sulfur:					
Ore (25 to 30 percent S) do	1,278	1,221	1,084	966	699
Concentrate (90 percent S) do	57	76	90	95	67
Fused do	81	70	54	42	29
Talc and steatite	124,391	[r] 134,904	[r] 129,510	[r] 139,335	132,243
Mineral fuels:					
Asphaltic and bituminous rock, for distillation	263,103	233,065	201,856	271,743	237,911
Coal:					
Lignite:					
Xiloid (20 percent moisture) thousand tons	1,239	1,521	1,775	1,366	1,201
High grade (Picean) do	7	4	1	----------	----------
Subbituminous ("Sulcis")	717,141	717,574	676,024	571,425	462,162
Anthracite	19,537	23,654	16,160	13,797	9,360
Briquets	27,000	29,000	59,000	127,000	70,000
Coke:					
From coke ovens thousand tons	3,715	[r] 3,897	[r] 4,328	[r] 4,595	4,683
From gasworks do	816	782	[r] 776	[r] 725	534
Natural gas million cubic meters	6,447	6,863	7,150	7,268	7,684
Natural gasoline (condensate)	58,947	57,142	55,079	55,068	63,123
Petroleum:					
Crude thousand tons	1,998	1,972	1,806	1,784	2,669
Refinery products:					
Gasoline do	4,399	4,782	5,886	6,519	7,407
Jet fuel do	529	687	650	706	793
Kerosine do	531	690	729	812	829
Distillate fuel oil [3] do	21,290	24,165	10,454	12,616	15,534
Residual fuel oil [4] do			18,777	21,561	25,384
Bitumen do	697	843	900	1,055	1,226
Petrochemical feedstocks do	627	736	710	797	1,106
LPG do	625	690	794	963	1,087
Lubricants do	166	155	167	169	259
Other do	121	168	204	312	507
Total do	28,985	32,916	39,271	45,510	54,132
Refinery fuel and loss do	1,816	2,042	2,557	3,008	3,714
Crude oil processed do	30,801	34,958	41,828	48,518	57,846

---

[r] Revised. • Estimate. NA Not available.

[1] Antimony content was 48 percent in 1963 and 44 percent in 1964.

[2] Calculated from production reported in kilograms.

[3] Includes gas oil and fuel oils less than 5° Engler ("fluidissimo" and "fluido")

[4] Includes fuel oils more than 5° Engler ("semi-fluido" and "denso").

TRADE

The increase in exports and reduction of imports which characterized Italy's foreign trade in 1964 was reflected in mineral and metal trade. As compared with 1963, the value of exports increased by $165 million while imports were reduced by $220 million. Metals and metallic ores, principally iron and steel, accounted for most of these differences.

Exports of minerals and metals in 1964 were valued at $777 million, or 12.9 percent of all exports. Of the total value, metals and metallic ores made up nearly 45 percent, followed by mineral fuels (40 percent) and nonmetals [2] (15 percent). The principal commodities were rolled steel, fuel oils, gasoline, copper, aluminum, and marble.

Imports of metals and minerals were valued at $2,225 million, or 30.8 percent of all imports. Mineral fuels accounted for 54 percent of this value, followed by metals and metallic ores (40 percent) and nonmetals [2] (6 percent). The principal items were crude petroleum, fuel oil, rolled steel, coal, metal scrap and refined copper.

TABLE 2.—Italy: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Metals:				
Aluminum:				
Bauxite	----------	930	2,186	NA.
Ingots, powder, and scrap (including alloys).	135	252	19,260	West Germany 10,544; United Kingdom 5,066; Switzerland 2,272.
Semimanufactures (including alloys).	7,267	8,284	16,931	United States 6,218; West Germany 2,434; Belgium-Luxembourg 1,412.
Antimony	3	----------	1	NA.
Beryllium oxide ____ kilograms	----------	3,000	900	NA.
Bismuth, wrought and unwrought.	3	----------	1	NA.
Cadmium, wrought and unwrought.	83	3	29	West Germany 15.
Chromite	----------	1,500	2,071	France 1,502.
Cobalt:				
Metal	r 4	(1)	0.3	NA.
Oxide	----------	----------	12	NA.
Copper:				
Ore	4,314	2,534	2,502	Sweden 1,480.
Ashes and residues	933	342	2,327	Belgium-Luxembourg 1,206; Spain 374.
Sulfate	7,365	4,756	1,515	Greece 1,500.
Raw, including metalline	36	----------	370	West Germany 190.
Refined, in ingots:				
Unalloyed	172	20	4,039	West Germany 1,578; France 1,034; Netherlands 400.
Alloyed			6,434	West Germany 3,472; Netherlands 1,028; France 398.
Cupro-alloys	2	1	22	NA.
Scrap	191	248	2,892	West Germany 1,658; Austria 470; Belgium-Luxembourg 441.
Semimanufactures, including alloys.	9,681	8,990	25,455	West Germany 4,439; Israel 2,441; France 2,095.
Iron and steel:				
Roasted iron pyrites. ____ 1,000 tons	617	661	667	Austria 350; United Kingdom 165; Belgium-Luxembourg 57.
Iron ore, including dust and slag. ____ do	5	5	26	France 17.
Scrap ____ do	1	2	5	France 2; Belgium-Luxembourg 1.
Pig iron, sponge iron, grit and powder. ____ do	1	1	3	France 2.

See footnotes at end of table.

---

[2] Including finished marble, cement and lime, terracotta and refractory building materials but not porcelain, pottery, glass or nitrogenous fertilizers.

TABLE 2.—Italy: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Metals—Continued				
Iron and steel—Continued				
Ferroalloys:				
Ferromanganese ..... 1,000 tons..	1	2	8	United States 2; West Germany 2 Hungary 2.
Ferrosilicon ..... do....	4	2	1	NA.
Ferrochrome ..... do....	2	2	4	United States 2; Austria 1.
Other ..... do....	1	(2)	(2)	NA.
Total ..... do....	8	6	13	
Steel:				
Ingots and equivalent forms ..... do....	111	88	91	Switzerland 65; West Germany 16; Austria 6.
Semimanufactures:				
Bars and rods ..... 1,000 tons..	110	65	322	West Germany 104; France 42; Canada 23.
Sections ..... do....	16	19	159	West Germany 62; France 26; Iran 21; Austria 6.
Plates, sheets and strips ..... do....	286	298	482	Unspecified East Europe 92; Yugoslavia 71; Spain 52; France 37.
Coils ..... 1,000 tons..	15	15	11	Israel 5; France 2.
Pipes and fittings.[3] ..... do....	338	323	308	Libya 66; Argentina 56; East Europe 26; United States 18.
Other ..... do....	14	19	21	Switzerland 5; Yugoslavia 5; Turkey 2; United Arab Republic. (Egypt) 2.
Total[3] ..... do....	779	739	1,303	
Lead:				
Galena, finely pulverized	852	----------	34	NA.
Ore, including ashes and other residues.	5,603	r 4,500	5,517	Austria 5,000.
Unwrought, including alloys and scrap.	90	13	192	NA.
Semimanufactures	86	406	29	NA.
Lithium ore	----------	20	----------	
Magnesium:				
Crude, including alloys and scrap.	4,559	4,161	5,716	West Germany 3,955; France 850; Austria 289.
Semimanufactures	372	332	413	NA.
Manganese ore	644	738	678	NA.
Mercury ..... 76-pound flasks..	35,726	75,728	[4] 83,514	United Kingdom 21,666; Japan 19,517; West Germany 12,682.
Molybdenum	1	----------	2	NA.
Nickel:				
Unwrought, including alloys and scrap.	----------	2	207	NA.
Semimanufactures, including anodes.	728	987	668	Morocco 194; Iran 190; Bulgaria 96.
Platinum and related metals, including alloys.[5] ..... 1,000 troy ounces..	14	26	80	United Kingdom 22; West Germany 4; Hungary 2; Belgium 1.
Selenium ..... kilograms..	8,900	3,000	6,400	NA.
Silicon	8,601	8,999	9,383	West Germany 4,154; United Kingdom 2,129; Yugoslavia 760.
Silver, including alloys.[5] ..... 1,000 troy ounces..	80	103	482	NA.
Tantalum	----------	6	----------	
Tin:				
Unwrought, unalloyed, including scrap. ..... long tons..	23	6	61	NA.
Alloys, unwrought. ..... long tons..	190	16	189	Sweden 141.
Semimanufactures ..... do....	53	8	6	NA.
Titanium:				
Dioxide	11,704	15,308	13,264	United States 1,698; United Kingdom 1,691; France 1,112.
Metal, including scrap	----------	----------	3	NA.
Tungsten, powder and scrap	8	2	2	NA.
Uranium and thorium	NA	NA	NA	NA.
Zinc:				
Ore	67,006	39,675	49,263	Belgium-Luxembourg 13,392; Austria 12,800; France 7,102.
Ashes and residues	289	1,634	13,000	Yugoslavia 1,815.
Slab	2,122	302	1,491	United States 581.
Alloys and scrap	2	1	131	NA.
Semimanufactures	382	309	431	NA.

See footnotes at end of table.

TABLE 2.—Italy: Exports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Metals—Continued				
Other metallic ores, ashes and residues.	5,693	6,487	3,485	Belgium-Luxembourg 1,213; United Kingdom 681; West Germany 563.
Other metals	8	4	11	NA.
Nonmetals:				
Abrasives, natural:				
Corundum, garnet, tripoli and other.	140	562	402	NA.
Pumice (ground and crude)	135,445	343,825	321,734	Netherlands 129,259; West Germany 90,635; United States 5,391.
Andalusite, including kyanite and mullite.	303	218	445	NA.
Asbestos	7,890	6,412	9,017	West Germany 3,445.
Barite and witherite	46,773	22,408	11,186	NA.
Bromine	---	---	97	NA.
Cement, including clinker	135,142	149,176	174,638	Switzerland 68,897; Libya 25,356; Malta 15,117.
Chalk	760	225	509	NA.
Clays and earths:				
Bentonite	28,234	30,061	22,460	France 6,900; Libya 3,965; United Kingdom 3,354.
Diatomite	2,948	1,332	801	NA.
Earth pigments, including micaceous hematite.	[r] 542	381	1,597	NA.
Fuller's earth	97	23	16	NA.
Kaolin	111	272	350	NA.
Refractory clay and earth and other clay.	1,075	1,199	1,057	NA.
Cryolite	5	1	---	
Diamond, all grades..carats [5]	NA	35,000	320,000	United Kingdom 40,000.
Dolomite, raw and calcined	11,345	11,526	10,540	Switzerland 5,013.
Feldspar	17,005	19,433	21,763	West Germany 13,669.
Fluorspar	49,116	38,268	46,658	United States 34,651; Japan 5,080.
Graphite	1,613	1,516	1,292	NA.
Gypsum and anhydrite	7,185	9,367	13,368	NA.
Lime	13,555	18,646	24,057	Libya 22, 524.
Magnesite, raw and calcined	203	108	77	NA.
Mica	40	48	134	NA.
Nepheline	---	---	500	NA.
Potassium salts, crude	23	---	4,454	All to Yugoslavia.
Precious and semi-precious stone, natural. kilograms	571	1,082	1,026	NA.
Pyrite	158,268	101,853	47,455	Switzerland 31,824; Netherlands 10,100.
Quartz and quartzite	4,553	5,229	16,677	NA.
Salt	28,820	75,458	54,833	Norway 30,368.
Sand:				
Silica sand	3,616	1,686	1,973	NA.
Other	189,250	175,868	226,571	Switzerland 224,718.
Slate	3,311	3,429	4,101	NA.
Stone and gravel:				
Dimension stone, unworked:				
Alabaster and serpentine.	1,733	1,871	1,734	NA.
Marble and limestone	238,468	251,951	243,640	West Germany 59,000; France 31,000; United States 30,000.
Granite, porphyry and other.	32,580	32,024	31,723	NA.
Scrap, chips and powder.	300,955	339,859	313,594	West Germany 70,000; Belgium 50,000; United Kingdom 38,000; France 27,000.
Gravel and other	67,703	60,991	147,350	Switzerland 90,000.
Strontium minerals	91	89	134	NA.
Sulfur, crude and refined	14,071	7,657	4,459	Yugoslavia 2,869; Burma 200.
Talc and steatite	51,602	47,173	43,672	United States 13,434; United Kingdom 6,677; West Germany 5,742.
Other mineral materials	34,895	46,331	64,568	United Kingdom 62,167.
Mineral fuels:				
Asphalt and bitumen (natural)	251	398	650	NA.
Asphaltic and bituminous rock	8,229	8,753	6,324	NA.
Coal	4,708	24,143	4,218	NA.
Coke, including semicoke	173,531	149,068	99,843	Austria 29,612; Switzerland 20,386; Greece 15,610.

See footnotes at end of table.

TABLE 2.—Italy: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Mineral fuels—Continued				
Petroleum:				
Crude ..... thousand tons..	317	167	1	NA.
Refinery products:				
General exports, excluding international bunkers:				
Gasoline ..... thousand tons..	1,671	r 1,713	1,725	United Kingdom 413; Switzerland 315; Austria 288.
White spirit and solvent ..... do....	17	17	16	Austria 6; France 3; West Germany 3.
Jet fuel ...... do....	490	r 491	429	United States[6] 214; Greece 78; Switzerland 27.
Kerosine .... do....	246	r 298	271	India 92; Nigeria 41; Netherlands 27; Switzerland 18.
Gas oil ...... do....	3,422	r 4,116	5,103	Switzerland 1,083; France 915; Netherlands 730; United Kingdom 490.
Fuel oil[7] .... do....	3,073	r 3,100	3,093	United Kingdom 760; United States[6] 511; Austria 262; Switzerland 257.
Lubricants .. do....	19	28	54	Switzerland 7; India 7; France 7; Austria 5.
Bitumen .... do....	133	148	144	Austria 68; Switzerland 35.
LPG .... do....	17	36	47	Lebanon 15; France 14; Spain 8.
Paraffin ..... do....	1	1	1	All to South Africa.
International bunkers:				
Jet fuel ...... do....	r 362	r 415	440	
Gas oil, including diesel oil. ..... do....	r 444	r 480	498	
Fuel oil ...... do....	r 3,684	4,112	5,031	
Lubricants .. do....	14	16	17	

r Revised. NA Not available.

[1] Revised to none.

[2] Less than 0.5 of unit.

[3] Excludes cast pipe and fittings.

[4] Source: L'Industria Mineraria (Faenza). Anno 16, ser. 2, No. 4, April 1965, p. 210. Customs data incomplete.

[5] Calculated from quantities reported in kilograms.

[6] U.S. Navy (Mediterranean).

[7] Breakdown of grades not available.

TABLE 3.—Italy: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Metals:				
Aluminum:				
Bauxite	293,721	349,605	378,788	Yugoslavia 249,105; Sierra Leone 50,673; British Guiana 28,992.
Scrap	47,448	52,989	32,321	United States 10,598; Canada 8,742; France 2,216; Hungary 1,557.
Ingots including alloys	44,022	54,112	32,690	United States 7,358; Norway 6,108; Austria 4,560; Canada 4,558.
Semimanufactures	10,421	16,267	17,186	France 5,352; West Germany 2,333; Belgium-Luxembourg 2,167; United States 1,655.
Antimony, unwrought, including scrap.	394	598	331	Belgium-Luxembourg 153.
Beryllium:				
Oxide and hydroxide. kilograms..	300	r 5,000	300	NA.
Metal, unwrought ... do....	----------	----------	400	NA.
Bismuth, unwrought	33	42	36	United Kingdom 11.
Cadmium, unwrought	25	52	48	United States 14.
Chromium:				
Chromite	56,503	44,737	79,524	Turkey 35,796; U.S.S.R. 21,300; Philippines 9,679; Rep. of South Africa 7,942.
Metal, all forms	19	30	21	NA.
Cobalt:				
Oxide and hydroxide	150	281	246	Belgium-Luxembourg 183; United Kingdom 53.
Metal	235	r 367	299	Belgium-Luxembourg 257.

See footnotes at end of table.

TABLE 3.—Italy: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Metals—Continued				
Copper:				
Ashes and residues	455	363	151	NA.
Raw, including metalline	12,664	9,995	5,516	Rhodesia-Nyasaland 2,408; Rep. of South Africa 1,459; United States 774.
Scrap	23,440	21,870	13,902	France 4,931; West Germany 3,726; United States 1,177.
Refined:				
Unalloyed	227,000	214,000	152,403	Rhodesia-Nyasaland 39,689; United States 38,833; Congo (Léopoldville) 23,623; Chile 23,147.
Alloyed			37,603	United Kingdom 11,161; Rhodesia-Nyasaland 6,985; United States 5,675.
Semimanufactures, including alloys.	7,717	12,558	8,430	Yugoslavia 3,076; Switzerland 910; West Germany 620.
Gold, thousand troy ounces including alloys.[1]	3,697	2,472	1,010	United Kingdom 913.
Iron and steel:				
Roasted iron pyrite	3,670	1,416	5,960	NA.
Iron ore thousand tons	4,461	5,240	5,039	Brazil 919; Algeria 792; Venezuela 764; Mauritania 739; Liberia 644.
Scrap do	4,078	3,910	3,149	France 1,240; West Germany 1,117; United States 525; United Kingdom 63.
Pig iron do	796	891	535	U.S.S.R. 204; West Germany 182; Spain 36; Rep. of South Africa 22.
Ferroalloys:				
Spiegeleisen do	13	19	7	All from West Germany.
Ferromanganese do	44	55	54	France 21; Rep. of South Africa 14; Belgium-Luxembourg 6; Norway 5.
Ferrosilicomanganese. do	3	5	3	Mainly from Norway.
Ferrosilicon do	6	8	7	Yugoslavia 3; Rep. of South Africa 1.
Ferrochrome and ferrosilicochrome. do	10	15	27	France 8; Turkey 3; Rhodesia 1.
Other thousand tons	2	2	2	France 1.
Total do	78	104	90	
Granules and powder. do	7	8	3	France 2.
Steel:				
Ingots and equivalent forms. do	446	601	315	France 118; West Germany 66; Belgium-Luxembourg 33; United States 29.
Semimanufactures:				
Bars and rods. thousand tons	253	327	159	France 51; West Germany 47.
Sections do	274	321	138	West Germany 58; Belgium-Luxembourg 33.
Plates, sheets and strips. do	1,279	1,593	959	France 283; West Germany 216; Belgium-Luxembourg 140.
Coils thousand tons	570	922	1,079	West Germany 216; United Kingdom 204; Japan 178; Netherlands 116.
Pipes and fittings.[2] do	47	60	47	West Germany 16; United Kingdom 5; Sweden 4.
Other do	25	46	39	West Germany 12; Austria 6 France 5.
Total [2] do	2,448	3,269	2,421	
Lead:				
Ore	8,156	20,966	9,365	Morocco 6,025; Greece 3,003.
Ashes and residues	1,427	1,258	782	NA.
Scrap	20,624	21,381	16,197	France 6,918; Switzerland 4,313 West Germany 1,512.
Crude and refined, including alloys.	47,876	38,965	36,338	Mexico 6,924; Australia 5,589; Peru 5,124; Rep. of South Africa 4,563.
Semimanufactures	4,715	3,813	2,482	Yugoslavia 2,010.
Lithium ore	20	413	2,384	NA.
Magnesium:				
Unwrought, including alloys and scrap.	138	378	663	NA.
Semimanufactures	20	43	23	NA.

See footnotes at end of table.

TABLE 3.—Italy: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Metals—Continued				
Manganese:				
Ore	103,393	168,391	105,850	Egypt 53,041; Congo (Léopoldville) 17,201; U.S.S.R. 9,100; Brazil 5,097.
Unwrought and scrap	112	130	536	NA.
Mercury 76-pound flasks	609	392	290	NA.
Molybdenum:				
Ore	1,168	1,133	1,241	United States 1,216.
Unwrought and semimanufactures.	36	19	40	NA.
Nickel:				
Matte, speiss, etc	1,024	1,062	1,014	Canada 831; United Kingdom 140.
Scrap	645	607	182	NA.
Unwrought, including alloys.	4,433	6,164	7,211	United Kingdom 2,922; Canada 2,615; Norway 1,012; France 231.
Semimanufactures, including alloys and anodes.	1,865	1,430	912	United Kingdom 268; West Germany 134; Norway 79.
Platinum-group metals:				
Platinum, including alloys and platinum black.[3] troy ounces	79,000	40,670	49,000	United Kingdom 28,000; United States 5,530; U.S.S.R. 4,560.
Other platinum group.[3] do		22,700	19,130	United Kingdom 14,880; U.S.S.R. 2,635.
Selenium	NA	21	28	Sweden 8; Belgium-Luxembourg 4.
Silicon	NA	80	26	NA.
Silver, including alloys.[1] thous. troy oz	18,602	19,509	21,457	West Germany 9,263; United States 6,575; United Kingdom 2,237.
Tantalum:				
Ore kilograms	----------	2,500	----------	
Metal, all forms do	1,000	7,400	1,600	United Kingdom 200.
Tin:				
Unwrought, unalloyed. long tons	4,341	r 5,168	4,790	Malaysia 3,579; Netherlands 806.
Alloys, including scrap. do	869	r 727	412	Netherlands 269; Denmark 54; Malaysia 53.
Semimanufactures, including alloys. do	79	r 101	30	NA.
Titanium:				
Ore	68,671	98,913	112,228	U.S.S.R. 34,925; Finland 21,965; Australia 16,433; Norway 14,650.
Dioxide	NA	13,694	14,531	West Germany 5,581; United Kingdom 3,514; Belgium-Luxembourg 2,349.
Metal, all forms	66	24	43	NA.
Tungsten:				
Ore	118	80	60	NA.
Metal, all forms	34	r 41	28	NA.
Uranium and thorium:				
Ore	283	42	----------	
Metal, all forms	1	1	NA	NA.
Vanadium pentoxide	NA	115	232	West Germany 180.
Zinc:				
Ore	1,093	9,065	1,040	Greece 790.
Ashes and residues	9,293	9,454	5,512	Switzerland 1,360; West Germany 1,329.
Scrap	5,237	7,117	4,571	West Germany 1,500; France 972; Switzerland 943.
Unwrought, unalloyed	26,837	29,417	42,304	Belgium-Luxembourg 6,491; Australia 5,442; Bulgaria 4.967.
Alloys	2,544	1,909	1,181	Belgium-Luxembourg 1,039.
Semimanufactures	2,571	3,741	3,009	Belgium-Luxembourg 2,240; West Germany 160.
Zirconium:				
Ore	7,539	11,156	13,238	Australia 13,032.
Metal kilograms	16,000	1,100	700	NA.
Other metals and metallic ores:				
Ore	1,900	2,016	2,141	Bolivia 435; Thailand 362.
Ashes and residues	11,141	12,778	15,479	Austria 6,503; Yugoslavia 2,049; France 2,029; Hungary 1,794.
Alkali and alkaline-earth metals.	NA	4,319	4,959	West Germany 2,187; France 1,496; United Kingdom 686.
Rare earth metals	NA	59	3	NA.
Other base metals, wrought and unwrought. kilograms	NA	r 100	2,600	NA.
Ore of radioactive and rare earth metals. kilograms	NA	----------	1,400	NA.

See footnotes at end of table.

TABLE 3.—Italy: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Nonmetals:				
Abrasives (natural):				
Corundum and garnet	258	205	212	NA.
Emery	1,777	1,723	1,369	(1963: Greece 1,663.)
Tripoli and other	1,247	1,379	1,420	NA.
Andalusite, kyanite, etc., including mullite.	11,438	12,018	10,596	Poland 4,650; India 3,100; United Kingdom 872.
Alum rock	-------	-------	17	NA.
Asbestos	40,844	38,757	43,890	Rep. of South Africa 16,758; Canada 16,618.
Barite and witherite	19,429	21,595	27,858	Spain 22,359.
Borates	58,208	50,175	54,498	Turkey 51,016; United States 3,482.
Bromine	NA	51	53	NA.
Cement, including clinker	190,108	120,638	163,918	Tunisia 55,615; Israel 52,446; France 49,894.
Chalk	5,597	5,887	6,460	France 5,712.
Clays and earths:				
Bentonite	4,344	4,018	4,716	NA.
Diatomite	2,508	1,663	7,087	NA.
Fuller's earth	6,410	7,007	4,744	United States 1,078.
Dinas earth (artificial)	NA	NA	18,303	West Germany 15,285.
Earth pigments	1,043	242	354	NA.
Kaolin	205,656	227,643	280,000	United Kingdom 198,900; United States 18,870.
Kaolinitic earth	3,114	4,285	5,650	NA.
Refractory and other clays	460,084	[r] 524,816	467,625	France 182,335; West Germany 95,434; Czechoslovakia 47,749; United Kingdom 42,604; Poland 36.400.
Cryolite and chiolite	462	1,080	910	Denmark 870.
Diamond, all grades..carats [3]	345,000	155,000	475,000	United States 105,000; Belgium-Luxembourg 40,000; United Kingdom 20,000.
Dolomite, raw and calcined	2,165	1,082	1,086	NA.
Feldspar	9,678	11,441	10,981	West Germany 5,805; Sweden 2,363.
Fertilizer raw materials:				
Phosphate rock. thousand tons	1,574	1,479	1,716	United States 784; Tunisia 476; Morocco 312.
Potassium salts, crude. do	38	38	40	France 31; West Germany 9.
Potassium chloride..do	157	132	171	Israel 55; Spain 46; France 44; West Germany 21.
Thomas slag..do	24	18	2	NA.
Other natural fertilizer. do	7	2	2	NA.
Fluorspar	8,126	9,935	14,793	Spain 13,583.
Graphite	8,908	10,367	9,328	Austria 6,733; West Germany 1,190; Madagascar 1,085.
Gypsum and anhydrite	403	556	616	NA.
Iodine, crude	NA	36	129	Chile 75.
Lime, including marl	NA	3,641	3,152	NA.
Magnesite:				
Raw	15,152	12,612	15,528	NA.
Calcined	32,518	26,472	29,834	Austria 13,757; Yugoslavia 8,490; Greece 4,531.
Meerschaum	NA	440	2	NA.
Mica:				
Sheet	1,665	669	518	India 210.
Scrap and ground	2,033	1,165	1,330	NA.
Nepheline and nepheline syenite.	49	270	748	NA.
Pegmatite	1,340	1,536	1,304	NA.
Precious and semiprecious stones, natural. kilograms	13,074	76,039	21,129	NA.
Precious and semiprecious stones, synthetic, including dust and cuttings. kilograms	NA	[r] 9,965	22,030	France 16,056; Switzerland 5,302.
Pyrite	689,922	766,110	854,100	Cyprus 353,540; U.S.S.R. 337,505; Turkey 71,375; Yugoslavia 41,560; Greece 39,050.
Quartz and quartzite (excluding industrial piezoelectric).	30,537	45,654	52,757	Switzerland 14,358; West Germany 12,281.
Salt	143,710	55,851	37,541	Spain 35,290.
Sand:				
Silica	364,633	435,774	467,712	Belgium-Luxembourg 261,784; France 124,363; Netherlands 64,946.
Feldspathic, kaolinitic and other.	2,915	21,168	22,338	NA.

See footnotes at end of table.

TABLE 3.—Italy: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Nonmetals—Continued				
Slate	NA	142	235	NA.
Stone:				
Dimension stone, in blocks, slabs, etc. (unworked):				
Alabaster	746	1,615	1,789	NA (1963: Iran).
Marble and limestone	101,403	r 122,311	111,649	Portugal 60,657; Yugoslavia 16,272; Greece 7,943.
Granite, porphyry and other stone.	NA	r 22,247	23,465	Rep. of South Africa 5,652; Norway 5,207; Sweden 4,160.
Scrap, chips and powder.	NA	r 4,974	358	NA.
Gravel, riprap and other.	NA	4,717	5,012	NA.
Sulfur:				
Ore, in lumps	3	100	86	NA.
Raw and refined, in briquets or ground.	124	58	61,672	Canada 45,340; United States 14,450.
Talc and steatite	8,803	13,179	12,309	Austria 7,043; India 2,140.
Other nonmetallic ore materials.	26,218	28,730	31,432	Rep. of South Africa 15,618; West Germany 5,246; United Kingdom 810.
Residue and calcines of ceramic materials.	NA	5,496	2,887	NA.
Mineral fuels:				
Asphalt and bitumen (natural), including rock.	2,472	2,536	2,710	United States 2,469.
Coal thousand tons	10,785	11,217	10,202	United States 7,281; West Germany 619; U.S.S.R. 463; Rep. o South Africa 213.
Coke and semicoke do	327	674	365	West Germany 252; United Kingdom 45; Spain 29.
Lignite, including agglomerates. do	237	289	341	West Germany 206; East Germany 89; Yugoslavia 30.
Peat, including agglomerates. do	10	4	6	West Germany 4.
Petroleum:				
Crude do	NA	47,145	55,220	Kuwait 21,220; Saudi Arabia 10,102; Iraq 6,914; U.S.S.R. 6,708; Libya 4,858; Iran 1,902; United Arab Republic (Egypt) 1,703; Venezuela 905; Algeria 856.
Refinery products:[4]				
Gasoline do	NA	[5] 63	153	United Arab Republic (Egypt) 46; Netherlands Antilles 34; United States 22.
Gas oil do	NA	36	15	NA.
Fuel oil do	NA	2,579	1,814	U.S.S.R. 369; Egypt 315; Kuwait 256; Rumania 224; Venezuela 104.
Lubricants do	NA	160	148	United States 72; Netherlands 30; France 16.
Petroleum coke do	NA	195	228	United States 205; Netherlands 13.
LPG do	NA	14	9	France 8.
Other products do	NA	125	170	United States 126.
Total do	NA	3,172	2,537	

---

r Revised. NA Not available.

[1] Calculated from quantities reported in units of 100 kilograms.

[2] Excludes cast pipe and fittings.

[3] Calculated from quantities reported in kilograms.

[4] Sources: Ministero dell'Industria e del Commercio (Rome). Industria del Petrolio in Italia 1963. 97pp. Instituto Centrale di Statistica (Rome). Statistica Mensile del Commercio con L'Estero. Anno 30, ser. 5, No. 12, December 1964, 328 pp. (Note: Tariff classification of petroleum products was changed on Nov. 1, 1964, to conform to EEC standards as adopted on May 8, 1964 (Schedule G). As the new classifications are substantially different from those used previously, quantities of each product are reported for two periods: (1) January-October and (2) November-December. Quantities listed in the 1964 column of table 3 are the sum of the quantities reported for each period.

[5] Aviation gasoline.

COMMODITY REVIEW

Aluminum.—Bauxite production again declined about 12 percent. As in 1963, the decrease was mainly due to gradual exhaustion of Montecatini's San Giovanni Rotondo mine near Foggia. The mine produced 176,000 tons of bauxite in 1964.

Exploration and testing of other bauxite deposits was continued on the mainland and in Sardinia. Bauxite reserves of all grades in Sardinia were estimated to total 10 million tons, but because of the small size of many deposits the commercial possibilities were uncertain.

Imports of bauxite increased about 8 percent and made up for the decline in production. Yugoslavia remained the principal supplying country, while imports from India and Australia were largely replaced by shipments from Sierra Leone and Greece.

Production of primary aluminum increased 25 percent in 1964, exceeding 100,000 tons for the first time. Most of the increase was due to a full year's operation of the new plant at Fusina (near Venice) that started production near the end of 1963. The plant is owned by Societa Alluminio Veneto Anonima (SAVA), an affiliate of Swiss Alminium Ltd. (Alusuisse). Montecatini also increased production when modernization of the Mori plant at Trento was completed in midyear. At yearend, annual primary metal production capacity totaled 136,000 tons (Montecatini-80,000 tons, SAVA-50,000 tons, and Alcan Alluminio Italiano S.p.A. 6,000 tons). High-amperage reduction units, installed during the past 2 years, accounted for about half of the total capacity (27,000 tons at Bolzano; 22,000 tons at Fusina; and 15,000 tons at Trento).

Montecatini continued to be the principal producer, with outputs of 51,713 tons at Bolzano and 12,460 tons at Trento. SAVA's share of national production increased from 29 to 41 percent in 1964 and consisted of 27,205 tons from Porto Marghera and 19,894 tons from Fusina. Alcan S.A. produced 3,742 tons at its Borgofranco d'Ivrea plant north of Turin. Total employment in metal production (in December) was about 2,500.

As compared with 1963, imports of aluminum were reduced by one-third and $7 million in value, while exports increased fourfold and $17 million in value. The apparent domestic supply (production plus net imports) of aluminum was about 180,000 tons in 1964 and 195,000 tons in 1963. According to a Montecatini official, consumption of aluminum in Italy in 1963 was 2.5 kilograms per capita.

A new rolling mill was nearing completion at Fusina and was scheduled to begin production in 1965. The mill, with an annual capacity of 47,000 tons, was being constructed by Lavorazione Leghe Leggere of Milan, a company formed by SAVA and Montecatini. The new plant has 7 melting furnaces (6 electric induction and 1 gas-fired reverberatory), a casting machine that can cast up to 6 tons of aluminum, a plate mill, and a mill that will produce sheet (up to 2,800 mm wide and 10,000 mm long, with a minimum thickness of 2 mm) and strip (up to 2,000 mm wide and 0.4 mm thick).

Società Lavorazioni Industriali Metalli (SLIM), owned 60 percent by Reynolds International and 40 percent by Società Edison of Milan, began construction in December of a rolling mill at Cisterna about 50 kilometers south of Rome. The plant will have an annual capacity of 25,000 tons of semifinished and finished aluminum products and is being built by the Innocenti Co. of Milan in cooperation with the Blaw-Knox Co. of Pittsburg, Pa. About $6.4 million was reportedly loaned to SLIM by the Cassa per il Mezzogiorno (Fund for the South).

A new firm was formed to construct an aluminum plant in Sardinia, with an annual capacity of 100,000 tons. The venture was capitalized at $16 million, and partners (with participation in percent) include the State-owned Società Mineraria Carbonifera Sarda (CARBOSARDA) (51 percent); Società Atlantic of Belgium (24.5 percent); and Harvey Aluminum, Inc. (24.5 percent). The agreement also provides for participation of the Montecatini Co., in which case CARBOSARDA would have a 40-percent interest with 20 percent held by the other three firms. Sixty percent of the capital required for the project was to be raised by loans, and 21 percent was to be met by grants from the Cassa per il Mezzogiorno and the Sardinian Rebirth Plan.

Other foreign investments reported in the aluminum industry in 1964 included $624,000 by Aluminium Ltd. and $1.6 million by Alusuisse.

Cobalt.—A 10-million-ton deposit of cobalt-bearing ore was reportedly discovered in the Carnia region of northeastern Italy. The ore also was reported to contain nickel, copper, and iron. No further details were available.

Copper.—Italy remained among the world's principal consumers of copper in 1964 although net imports were 67,000 tons less than in 1963. Consumption of refined copper dropped by 11 percent to 199,000 tons[3] owing to reduced domestic demand and sharply increased exports. Exports of copper (all forms) were valued at $37 million, a fourfold increase over 1963 exports, while the value of imports decreased 9 percent to $145 million.

Production of semimanufactures included 173,000 tons of copper and 120,000 tons of copper alloy products. Most of the 30,000-ton drop in total output occurred in alloy products, particularly in bars and rods where production decreased by 15,500 tons. Copper tubes were the only item to show increased production in 1964.

Italy's small output of mine copper also decreased in 1964 by an estimated 220 tons. Most of the concentrate was exported. Copper ore reserves in Sardinia were estimated to total about 500,000 tons containing 1.3 percent copper, 2.7 percent zinc, and 0.1 percent lead. Most of the reserve is in the Funtana Raminosa mine area south of Nuoro.

Iron and Steel.—Except for a continuing increase in productive capacity, trends in the Italian iron and steel industry in 1964 differed from 1963 in several respects. Domestic steel consumption was 14 percent (2 million tons) below the 1963 level of 13.6 million tons owing to recessional trends in the mechanical and engineering, automobile, household appliance, and construction industries as well as drawdown of consumers' stocks. Production of steel, however, dropped only 3.6

---

[3] World Non-Ferrous Metal Statistics (Birmingham). V. 18, No. 6, August 13, 1965, p. 9.

percent to 9.8 million tons as exports increased by 69 percent to 1.4 million tons and imports were severely curtailed. Total imports of metal were reduced by 25 percent to 6.5 million tons and the trade deficit attributable to iron and steel decreased from $520 million in 1963 to about $280 million in 1964.

New capital investments totaled about $430 million in 1964 as expansion of production facilities was continued in both private and public sectors of the industry. An electric steel plant with an annual capacity of 360,000 tons was completed at the Sesto San Giovanni Works of Acciaierie Ferriere Lombardo Falck S.p.A. (A.F.L. Falck Co.) near Milan. Completion of the Linz-Donawitz (LD) shop and first blast furnace at the State-owned Taranto steelworks by November increased Italian productive capacity to more than 5 million tons of pig iron and 12 million tons of steel annually. These capacities were scheduled to increase by 15 to 20 percent early in 1965, as new blast furnaces at Taranto and Trieste, as well as the LD shop at Bagnoli were almost completed by yearend.

A slow but steady decline in employment reduced the number of workers in the industry to 56,271 at yearend, 4 percent less than at the end of 1963. The average direct hourly wage in October was equivalent to $0.81.

TABLE 4.—Italy: Salient statistics of iron and steel industry

(Thousand metric tons unless otherwise specified)

	1963	1964
Production:		
Pig iron:		
Blast furnace	3,508	3,249
Electric	232	249
Total	3,740	3,498
Steel:		
Open hearth	5,266	4,886
Electric furnace	4,235	4,226
Thomas converter	655	449
LD converter	------	231
Oil furnace ... tons	742	1,443
Bessemer converter ... do	19	------
Total	10,157	9,793
Ingots [1]	9,961	9,626
Castings	196	167
Hot rolled products:		
Rails and accessories	151	169
Broad-flanged beams	45	62
Other beams and sections	589	582
Bars and rods [2]	2,848	2,660
Wire rod	563	553
Universal plates	13	11
Coils	1,636	1,650
Sheet	846	818
Hoop and strip	429	468
Seamless tube	817	724
Rims and wheels	43	45
Total	7,980	7,742
Other rolled products (from coils, etc.):		
Hot rolled sheet and strip	239	266
Cold rolled sheet and strip	1,664	1,858
Tinplate	214	188
Galvanized and other coated	[r] 119	214
Electrical sheets	77	80
Other products:		
Rounds and bars for pipe	276	232
Welded pipe	549	448
Rough forgings and castings	227	201

See footnotes at end of table.

TABLE 4.—Italy: Salient statistics of iron and steel industry—Continued
(Thousand metric tons unless otherwise specified)

	1963	1964
Consumption:		
Apparent steel consumption, kilograms per capita	[r]278	[3]239
Raw materials:		
Pig iron production:		
Iron ore, direct to furnaces	3,506	3,029
Iron ore, agglomerated	2,554	2,575
Pyrite cinder, in agglomerating plants	[r]209	162
Manganese ore	60	73
Coke, kilograms per ton of pig iron	636	640
Coke, in blast furnaces	2,398	2,250
Coke, in agglomerating plants	145	158
Scrap	19	15
Steel production:		
Iron ore	227	175
Scrap	7,459	7,346
Pig iron	[r]3,736	3,465
Spiegeleisen and carbon-ferromanganese	64	57
Energy:		
Petroleum products	970	1,200
Electricity, million kilowatt hours	6,525	[3]6,600
Gas, thousand tons S.C.E.[4]	1,615	NA
Production facilities:		
Number of blast furnaces:		
Available, units	13	14
Operating, do	12	13
Number of open-hearth furnaces:		
Available, do	52	53
Operating, do	[r]47	39
Number of electric furnaces:		
Available, do	194	193
Operating, do	[r]149	142
Employment (December), do	58,561	56,271
Average direct hourly wage, lire	462	[5]508

[r] Revised. NA Not available.
[1] Includes special steel as follows: 1963—1,221; 1964—1,103.
[2] Includes 145,000 tons of rolled scrap in 1963 and 124,000 tons in 1964.
[3] Estimate based on figures for 9 months (January to September).
[4] Calculated from units reported in billion kilocalories, using conversion factor of 7,000 kilocalories per kilogram.
[5] October.

Sources: Associazione Industrie Siderurgiche Italiane (Milan). Rilevazione Statistiche. Produzioni Anno 1963 and 1964. Instituto Statistico delle Comunità Europee (Luxembourg). Siderurgia. No. 2, 1965, 208 pp. Istituto Statistico delle Comunità Europee (Luxembourg). Statistiche dell'Energia. No. 2, 1965, 149 pp.

Iron Ore.—Crude iron ore production continued to decline in 1964, falling to 1,570,000 tons, or 9 percent less than in 1963. Marketable concentrates amounted to about 60 percent of this tonnage. Inland deliveries totaled 935,000 tons and stocks at yearend were 615,000 tons.

Mine employment (December) was reduced to 1,546, 25 percent less than in 1963. Productivity increased, averaging 12 tons of ore per man-shift in open pits (9 tons in 1963) and 5.5 tons in underground mines (4.7 tons in 1963), but labor costs also increased. The direct hourly wage (average of 12 months) increased 26 percent in open pits and 43 percent for underground workers as compared with that of 1963. In October, hourly pay averaged about $0.65 in open pits and $0.90 underground.

Production of high-grade pelletized iron concentrate (65 percent iron) from pyrite was started in May at Montecatini's Follonica plant near Piombino. The plant's capacity of 550 tons of pellets per day was scheduled to be doubled early in 1965.

Production and consumption of iron ore agglomerates increased in 1964 although total consumption of iron ore was 7 percent less than in 1963. Consumption of agglomerates per ton of pig iron produced was 734 kilograms as compared with 677 in the previous year and 811 to 1,140 in other EEC countries.

TABLE 5.—Italy: Iron ore reserves as of Dec. 31, 1961

(Thousand metric tons)

Province or region	Proved	Probable	Possible	Total	Percent of total reserves
Elba	4,508	10,740	900	16,148	27.8
Piedmont	7,500	8,100	9,000	24,600	42.3
Lombardy	1,872	1,460	5,800	9,132	15.7
Sardinia	2,420	2,490	3,350	8,260	14.2
Total	16,300	22,790	19,050	58,140	100.0

Source: Comunità Europee (Luxembourg). Informazioni Statistiche. No. 3, 1963, p. 96.

Brazil remained the principal source country for iron ore imports, but the share of African countries in total imports increased from 30 to 48 percent in 1964. Combined imports from Mauritania and Liberia, where Finanziaria Siderurgica (FINSIDER) has substantial interests in iron mining ventures, increased by 681,000 tons. Deliveries from Sweden, Peru, and Chile were greatly reduced, and imports from India were cut nearly 50 percent for the second consecutive year. Italian iron ore interests in India increased as Società Mineraria Siderurgica (FERROMIN), the iron mining subsidiary of the FINSIDER group, took over the remaining 50 percent share in Sesa Goa Ltd., which was owned by Gewerkschaft Exploration.

Pig Iron.—Production of pig iron decreased by 6 percent in 1964 and amounted to about 78 percent of total capacity as compared with 90 percent in 1963. The reduced output was due to temporary shutdown of blast furnaces at Bagnoli and Cornigliano works for plant expansion and repairs. Production began to rise in October as the first blast furnace at Taranto started operating, and the national monthly output in December was a record 368,000 tons. Total production in 1964 was 5.7 percent of EEC output as compared with 7.1 percent in 1963. Production of Thomas pig iron was discontinued in October.

The Italsider group, Alti Fornie e Acciaierie Riunite Ilva e Cornigliano S.p.A., again accounted for 90 percent of national output, producing 3,139,000 tons. The A.F.L. Falck Co. produced 158,000 tons and Società Nazionale Cogne probably accounted for most of the remainder.

Pig iron imports were reduced by 40 percent in 1964. Imports decreased by 240,000 tons from EEC countries (principally West Germany) and by 128,000 tons from other countries including 73,000 from East Europe. The total reduction was approximately equal to the drop in Italy's production of steel.

At yearend, total pig iron production capacity was about 5.5 million tons annually. Early in 1965, this capacity was scheduled to be increased by 1.1 million tons at Taranto and 160,000 tons at Trieste.

Ferroalloys.—Total ferroalloy output in 1964 was about the same as in 1963. Domestic supplies, however, were 20,000 tons less because of changes in trade. Changes in production, consumption, and trade mainly concerned manganese and chromium ferroalloys as well as related raw materials.

Decreased output and consumption of manganese ferroalloys was mainly due to reduced output of iron and steel, although exports of refined ferromanganese increased sharply. Compared with 1963, spiegeleisen imports dropped by 66 percent and manganese ore imports 40 percent. The main sources of ore supply were unchanged although shipments were greatly reduced from the Republic of the Congo (Léopoldville) and the U.S.S.R.

Tripled production of ferrochromium was accompanied by increased exports (mainly to the United States) and increased production of stainless steel. Imports of chromite were doubled, with deliveries from Turkey increasing fivefold.

TABLE 6.—Italy: Ferroalloy production

(Metric tons)

	1963	1964
Spiegeleisen	5, 569	1, 351
Siliceous spiegeleisen	1, 778	2, 086
Siliceous pig iron	983	1, 657
Ferromanganese (carbon)	23, 731	14, 356
Ferromanganese (refined)	5, 386	10, 602
Ferro-silico-manganese	34, 280	27, 423
Ferrosilicon	44, 212	44, 807
Ferrochromium (carbon)	4, 932	10, 894
Ferrochromium (refined)	297	4, 558
Silico-chrome	----------	2, 931
Silico-aluminum	644	1, 107
Calcium silicide	3, 735	3, 098
Ferromolybdenum	846	873
Ferrotitanium	202	236
Ferrophosphorus	471	771
Ferrovanadium	81	131
Ferrotungsten	34	21
Total	127, 181	126, 902

Source: Associazione Industrie Siderurgiche Italiane (Milan). Rilevazioni Statistiche. Produzioni Anno 1963 and 1964.

Italy continued to be the sole producer of manganese ore in the EEC and maintained production at the 1963 level. Seventy thousand tons of ore were reportedly produced at the Gambatesa mine by FERROMIN, with concentrates shipped to Italsider's ferroalloy plant at Darfo in the province of Brescia.

Scrap.—Imports of iron and steel scrap in 1964 were reduced by 20 percent. Imports from the United States were cut by 50 percent (556,000 tons) and those from the United Kingdom by 75 percent (230,000 tons). Imports from EEC countries increased 150,000 tons and accounted for 76 percent of scrap imports are compared with 60 percent in 1963. France and West Germany remained the principal suppliers.

Total scrap consumption was 7,556,000 tons, including 149,000 tons in rolling mills and 46,000 tons in independent steel foundries. In iron and steel production, consumption of scrap was 4 kilograms per ton of pig iron and 755 kilograms per ton of steel.

Steel Ingots.—State-owned steelworks produced 51 percent of Italy's steel in 1964, with the Italsider group accounting for 3,885,000 tons, or 40 percent of national production. Production by private firms (4,772,000 tons) was slightly higher than in 1963 and their share of total production increased. National output was 85 percent of capacity as compared with 92 percent in 1963. The decline in steel output in 1964 was reversed in the last quarter and the December production of 938,000 tons set a new monthly record for the industry. The increasing production was primarily due to operations at Taranto.

Open-hearth furnaces accounted for 50 percent of all steel produced in 1964; electric furnaces supplied 43 percent, and Thomas converters, 4.6 percent. Linz-Donawitz (LD) converters, in operation for the first time, accounted for the remaining 2.4 percent of production. The Thomas process was discontinued in October, as the converters at Bagnoli were replaced by LD facilities. The LD shop at Bagnoli reportedly includes three 125-ton converters, supplied by three oxygen plants with a total daily capacity of 500 tons. The combined LD capacity of the Taranto and Bagnoli works was expected to be more than 3 million tons of steel annually by early 1965.

The use of oxygen was continued at the Cornigliano works near Genoa where two 200-ton oxygen plants were supplying six open-hearth furnaces. In other developments, construction of two new electric steel furnaces was completed by the A.F.L. Falck Co. near Milan.

Production of special steel continued to decline in 1964 as output of structural steel again decreased by 150,000 tons. The decrease was partly offset by gains in production of stainless and bearing steels including a 20,000-ton increase in steel containing more than 17 percent chromium. Castings of special steel made up about 25 percent of all steel castings and 4 percent of special steel output.

Rolled Steel.—Reduced output of commercial bars and rods and seamless tube was mainly responsible for a 3-percent drop in produc-

TABLE 7.—Italy: Production of special steel

(Metric tons unless otherwise specified)

	1962	1963	1964
High carbon steel:			
Structural	608, 076	562, 829	478, 438
Tool	5, 557	1, 686	781
Total	613, 633	564, 515	479, 219
Alloy steel:			
Structural	611, 950	506, 116	434, 697
Tool	21, 019	18, 462	16, 851
Bearing	55, 202	46, 265	64, 539
Stainless	65, 782	82, 245	103, 604
High speed	1, 286	1, 497	843
Other	2, 285	2, 378	3, 303
Total	757, 524	656, 963	623, 837
Total special steel	1, 371, 157	1, 221, 478	1, 103, 056
Produced in electric furnaces percent	83. 3	86. 4	89. 3

Source: Associazione Industrie Siderurgiche Italiane (Milan). Rilevazioni Statistiche. Produzioni Anno 1962, 1963, and 1964.

tion of hot-rolled items. Output of cold-rolled sheet increased by 10 percent, which was largely due to increased capacity of Italsider's mill at Novi Ligure. The Italsider group produced 3,346,000 tons of rolled products in 1964.

The cold-rolling mill of Terninoss S.p.A., a joint venture of the Terni Co. of the FINSIDER group and the United States Steel Corp., was completed during the year. Capacity was 25,000 to 30,000 tons annually of stainless steel products. The American firm signed another agreement in November with FINSIDER to modernize and expand the wire-drawing plant of Società Italiana Derivati Vergella (Deriver) at Torre Annunziata near Naples. The present annual capacity of the plant, 55,000 tons of wire, may be expanded by 50 percent.

La Magona d'Italia S.p.A. was operating a new tinplate plant (70,000 tons annual capacity) at Piombino. Also at Piombino, Italsider completed a small-diameter welded-pipe shop. In southern Italy, Acciaierie e Ferriere Pugliese planned to install a 550-millimeter rolling mill at the Giovinazzo works in Bari. The mill was expected to cost $1.5 million and would have an annual capacity of 65,000 tons of special steel products.

Rolled products accounted for the principal changes in steel trade in 1964. Exports increased 564,000 tons and $71 million in value. Exports by Italsider were 420,000 tons as compared with 196,000 in 1963. Imports were reduced by 858,000 tons and $108 million in value.

Prices for bars, sections, heavy plate, and cold-rolled sheet decreased by 2 to 5 percent during the year but increased 2.5 percent for hot-rolled sheet. Despite lowered prices and reduced domestic demand, domestic sales of rolled steel by Italsider increased to 2.7 million tons, a 12-percent increase over those of 1963.

Transportation.—Expansion of port facilities was underway at three Italsider plants in 1964. Ore and coal carriers of up to 60,000 tons displacement will be accommodated at Cornigliano's Sinigaglia works and up to 45,000 tons displacement at Piombino and Trieste. Several 10,000-ton barges were also being constructed for interplant movements of materials.

Lead, Zinc, and Cadmium.—Production of lead and zinc remained near 1963 levels as rationalization of the industry was continued in 1964. The major producers were engaged in consolidation and expansion of production facilities, notably in Sardinia where the industry hopes to double production by 1968.

New ore reserves were being developed in Sardinia and on the mainland at the Salafossa mine. Monteponi and Montevecchio S.p.A. continued work on the "Faina" and "Sartori" development projects in Sardinia. These projects, initiated in 1963, were intended to increase the company's annual mine output to 75,000 tons of contained metal in 1967 and 100,000 tons in 1969. The Faina project concerns the Montevecchio mine, while the larger Sartori scheme is to coordinate production at mines of the Monteponi group near Iglesias. During work on the Sartori project in 1964, new ore was found in the San Marco and San Giorgio mines, and the first sections of the Campo Pisano concentrator were nearly completed by yearend.

West of Nuoro, the Sos Enattos open-pit mine began production in October. Operated by Società Richerche Minerarie Sarde (RIMISA), a subsidiary of Monteponi and Montevecchio, the mine was to produce 500 tons per month of sphalerite concentrates containing 5 kilograms of cadmium per ton. The company completed expansion of the Porto Marghera zinc refinery in 1964 and was engaged in expanding the capacity of the Cagliari plant.

Società di Pertusola was increasing production capacity at the San Giovanni mine as well as the lead smelter at La Spezia and the zinc plant at Crotone. The company hoped to be able to produce 35,000 tons of lead and 40,000 tons of zinc annually by 1967.

Azienda Minerali Metallici Italiana (AMMI) planned to increase production of its Iglesias mines to 40,000 tons of contained metals annually and was considering expansion of capacity at the Ponte Nossa zinc plant to 36,000 tons.

Proposals for a 50,000-ton zinc plant in Friuli-Venezia Giulia and a 72,000-ton Imperial Smelter in Sardinia were being studied. The industry's efforts toward rationalization were aided by extension of EEC protective tariffs until March 1966, although tariffs toward Community countries were reduced. The industry's problems in Sardinia were complicated by an unexpected increase in the cost of electric power. According to the Monteponi and Montevecchio Co., labor costs in Sardinia have risen by 85 percent since 1957 while productivity increased only 35 percent and average metal content of mined ore declined.

Employment in the industry was practically unchanged from 1963 levels, with about 6,200 workers engaged in mining and 2,000 in metal production.

TABLE 8.—Italy: Lead and zinc metal production capacity as of Dec. 31, 1964

Metal	Company	Location of smelter or refinery	Annual capacity (metric tons)	Additiona annual capacity reportedly planned or under construction
Lead	Societá Mineraria e Metallurgica di Pertusola.	La Spezia (Liguria)	24,000	12,000
	Monteponi e Montevecchio S.p.A.	San Gavino Monreale (Sardinia).	36,000	--------
		Monteponi (Sardinia)	[1] 12,000	---------
	Total lead	-------------------------	[1] 72,000	12,000
Zinc [2]	Monteponi e Montevecchio S.p.A.	Porto Marghera (Venezia).	36,000	---------
	Monteponi e Montevecchio S.p.A.	Monteponi (Sardinia)	[3] 6,000	16,000
	Societá Mineraria e Metallurgica di Pertusola.	Crotone (Calabria)	25,000	15,000
	Azienda Minerali Metallici Italiana.	Ponte Nossa (Bergamo)	21,000	15,000
	Total zinc	-------------------------	88,000	46,000
Lead and zinc	Proposed Imperial Smelter A.M.M.I. and others.	San Antioco (Sardinia)	------------	32,000 (lead) 40,000 (zinc)

[1] Operational status of Monteponi plant is uncertain; parent company describes total Italian capacity as 60,000 tons or the combined capacities of the smelters at La Spezia and San Gavino.

[2] Electrolytic.

[3] As reported by the Monteponi and Montevecchio company; other sources list capacity as 9,000 tons.

In 1964, Italy was replaced by West Germany as West Europe's leading producer of mine zinc but continued to rank fifth in output of mine lead. In domestic production, Sardinian mines accounted for 75 percent of the lead and 52 percent of the zinc mined in 1964.

Production of lead concentrate was about the same as in 1963, but output of primary metal was 4,000 tons less and amounted to about 55 percent of total smelter capacity. The Monteponi and Montevecchio Co. accounted for 19,658 tons of concentrate and 21,412 tons of metal in 1964.

Production of mine zinc increased about 5 percent in 1964. Sphalerite ores accounted for 80 percent of total production; the remainder was made up by calamine ores of which one-fourth was ferruginous grade. Production of low-grade concentrate (19 to 24 percent zinc) was again reduced and was expected to cease in the near future. The Raibl mine of Società di Pertusola remained the nation's largest producer, with 30,000 tons of mine zinc. The Monteponi and Montevecchio Co. accounted for an additional 51,000 tons of concentrate and produced 32,000 tons of metal. National output of primary zinc was 85 percent of the total capacity of electrolytic plants.

Proved reserves of lead-zinc ore in Sardinia were estimated to contain (in recoverable concentrates) 1.5 million tons of zinc and 500,000 tons of lead. About half of the zinc is contained in oxidized ores. An additional 6 million tons of contained metal was estimated in "probable" ore. As of mid-1964, properties of the Monteponi and Montevecchio Co. were estimated to contain 1.3 million tons of zinc and 400,000 tons of lead.

Imports of lead and zinc concentrates in 1964 were reduced by more than 50 percent. Deliveries from Bulgaria and Peru, which totaled 14,600 tons in 1963, were apparently discontinued. Most of the lead and zinc ores (excluding ashes and residues) exported in 1964 were classed as "temporary exports"; the proportion was higher than in recent years. This included 86 percent of all lead exports and 75 percent of all zinc exports. Tariffs toward EEC countries were reduced by 30 lire per kilogram for lead and 20 lire per kilogram for zinc.

In 1963, consumption of lead totaled 118,000 tons including 92,000 tons of refined metal. Semimanufactures included pipe (18,300 tons); sheet, strip, and foil (10,000 tons); shot (9,500 tons) and 700 tons of other products.

Consumption of zinc in 1963 was 177,000 tons, including 113,000 tons of refined metal. Semimanufactures included 9,900 tons of sheet and strip as well as 500 tons of wire and other products. Consumption of cadmium was 360 tons in 1963 and 400 tons in 1962.

Magnesium.—Magnesium production in 1964 rose by 10 percent, the first significant increase since 1960. The increase was probably due to expanded capacity of the Bolzano plant of Società Italiana per il Magnesio e Leghe di Magnesio. Completion of the planned increase in plant capacity to 10,000 tons may be delayed owing to uncertainties regarding the cost of electric power.

Domestic consumption of magnesium in 1963 was 1,100 tons.

The magnesium oxide plant being constructed by the Sardamag Co. at San Antioco in Sardinia was nearly completed by yearend. The

TABLE 9.—Italy: Consumption of lead, zinc, and cadmium in 1963

Metal	Use	Percent of consumption
Lead	Semimanufactures [1]	37.3
	Batteries	27.5
	Cables	17.0
	Chemical	16.8
	Other	1.4
Total		100.0
Zinc	Semimanufactures [1]	37.1
	Galvanizing	32.2
	Castings [1]	18.6
	Chemical	11.0
	Other	1.1
Total		100.0
Cadmium	Electroplating	64.0
	Alloys	16.0
	Batteries	5.0
	Oxide and other	15.0
Total		100.0

[1] Including alloys.

plant will produce up to 50,000 tons of pelletized oxide per year, using seawater and limestone. Participating companies are Periclase, Ltd., of the United Kingdom, Didier-Werke A.G. of West Germany, and Saccer Refrattari of Turin, Italy. The plant was partly financed by the European Investment Bank of the EEC.

Mercury.—Italy, accounting for about 23 percent of world mercury production, ranked second to Spain in 1964 but remained the leading exporting country.

Domestic production increased only 5 percent in 1964 despite high prices and continued depletion of stocks. Exports exceeded production by a total of 47,000 flasks since the beginning of 1963. An increased share of exports was destined for the United Kingdom and Japan as shipments to France and the United States were reduced in 1964.

The industry continued to modernize production facilities and to develop new ore reserves, and an increase in production of 8 to 10 percent was predicted for 1965. Società Mineraria Monte Amiata added a 15-ton-per-day Pacific furnace to the Abbadia San Salvatore plant for processing higher grade ore. The furnace began operating early in 1964 and was installed after successful results were obtained from a similar unit installed at the company's Morone mine in 1960. The Abbadia plant also included four Gould furnaces with a total capacity of 600 tons of ore daily, and 20 tower furnaces with a total daily capacity of 160 tons. The company continued development on lower levels of the Abbadia mine, as well as evaluation of the Castagneto della Trinità property northeast of Rome.

Società Mercurifera Italiana (SMI), a subsidiary of the Edison group, was preparing a small open-pit mine near Santa Fiora in Grosseto. Production may begin in 1965 at the rate of 70 to 100 tons daily. The company also operated a new 100-ton-per-day multiple hearth furnace at the Bagnore mine in 1964. Recent expenditures by SMI in concessions near Monte Amiata reportedly totaled about

$320,000. Also in Grosseto, Società Mineraria Rimbotti, a subsidiary of Montecatini, began processing about 25 tons or ore per day at the Cantabbio mine.

NONMETALS

Asbestos.—Production of asbestos increased by nearly 20 percent in 1964 as Italy continued to be the principal West European producer. The increase in production was apparently due to increased domestic consumption as well as increased exports of fiber and asbestos cement Employment at yearend was 328 (336 in 1963).

Barite.—Production and exports of barite again declined in 1964. There was a further reduction of 30 percent in mine employment to 308 persons at yearend.

Società Miniere Riunite Varesine (MIRIVA) and Baroid International were cooperating in development of Sardinian deposits. MIRIVA's new concentrating plant at the Su Benatzu mine was scheduled to start production in 1965; concentrate will be shipped to Baroid's processing plant in San Antioco. Additional production was also expected in 1965 from the Santa Lucia barite-fluorspar-galena mine.

Bentonite and Kaolin.—Decreased production and exports of bentonite in 1964 was accompanied by an 18-percent drop in apparent consumption. Apparent consumption of kaolin (340,000 tons) was about the same as in 1963. Mine employment decreased by one-third and exploration for both materials was continued. Sardinian reserves of refractory bentonite were estimated at about 1 million tons.

Cement.—Production of cement continued to increase during 1964 but at a reduced rate compared with that of the previous 8 years. Despite increased production costs, a slump in construction activity, and lowest cement prices in Europe, productive capacity was increased to an estimated 26.3 million tons by yearend and was scheduled to reach 30 million tons by the end of 1965. Consumption of cement in 1964 was estimated at 22.5 million tons.

In 1963, the industry was comprised of 72 firms and 113 plants with a total annual capacity of 24.7 million tons. Italcementi Fabbriche Riunite Cemento, with 28 plants, was the largest producing company and accounted for 33 percent of national production. Independent companies produced 32 percent, while the remainder was produced by Cementerie del Tirreno (CEMENTIR) (13 percent), the Segni Co. (11.5 percent), and Unione Cementi Marchino (10.5 percent). Nearly 70 percent of production capacity was in northern Italy, about 20 percent in southern Italy, and 10 percent in Sicily and Sardinia. Five new plants were scheduled for completion in 1964, including eight rotary and five vertical kilns with an aggregate capacity of 1.6 million tons annually.

In October, CEMENTIR was loaned $900,000 by the European Investment Bank for expansion and modernization of the Bagnoli cement plant. Plant capacity was to be increased from 1 million to 1.25 million tons annually by a total investment of $2.56 million. The company's large new plant near Taranto was nearing completion by yearend; production was expected to start in 1965 at the rate of 500,000 tons annually, using local clay and limestone as well as slag from the new steelworks. The $19 million plant is expected to produce 2 million tons of cement annually and to employ 1,000 workers by 1966. The Italcementi Co. was also constructing a large plant at Palermo.

Dimension Stone.—Production of rough and finished marble and other dimension stone again declined in 1964 although the value of exports increased to $34 million. Shipments from the Carrara district totaled 368,000 tons, of which 246,000 tons were locally produced. Owing to reduced sales on the home market, total shipments from Carrara were the lowest since 1960; however, foreign deliveries again totaled 128,000 tons, the highest since World War II.

High production costs arising from numerous independent manual operations and low productivity continued to weaken the industry's competitive position in domestic and foreign markets. Portuguese marble has taken over an important share of the domestic market, and the National Association of Marble Producers reported that exports have been sharply reduced to 14 of the 18 countries which are the principal purchasers of Italian marble. Efforts to reduce costs in 1964 included mechanization of marble quarrying at Montecatini's Vagli property in Tuscany and a meeting of Sicilian producers in Custonaci to discuss coordination of production and sales.

Fertilizer Materials.—Production of potash ore in Sicily increased 16 percent in 1964. Most was produced from the Caltonissetta district from the San Cataldo and Palo mines of the Montecatini Co. and the Santa Caterina mine of Società Industriale Catanese (SINCAT). The Palo mine began production in midyear. In the Enna district, the Pasquasia mine of Società Trinacria probably produced some ore but the extent of operations was uncertain.

About two-thirds of total output was produced by the Montecatini Co. and was processed at the Campofranco sulfate plant. The remaining ore was presumably converted into sulfate and complex fertilizer at the Priolo plant of SINCAT.

Employment in the industry at yearend was 1,140 compared with 1,279 in 1963.

Fluorspar.—Production of fluorspar was practically unchanged in 1964 although exports were increased. Production of acid-grade concentrate included 60,000 tons from Sardinia and 20,000 tons from Montecatini's Prestavel mine on the mainland. Increased employment (from 804 to 1,047) in fluorspar mines during 1964 was in contrast to the decline in most other branches of the mining industry.

The Santa Lucia mine in Sardinia, owned by Sarramin-Sarrabus Mineraria S.p.A., was scheduled to begin production in 1965. Flotation concentrates of fluorspar, barite, and galena will be shipped to the ports of Cagliari and San Antioco. The mine and plant reportedly represent a total investment of $1.4 million, of which $400,000 was loaned to the company by the European Investment Bank.

No action was taken by the EEC Commission in 1964 to exempt Italian fluorspar from EEC tariff reductions. Special protection had been requested by the producers in 1963.

Gypsum.—Production or consumption statistics for gypsum and lime in 1964 were not available. A new labor contract for workers in both industries was negotiated in March.

Gypsum consumption in 1963 was reported as 2.2 million tons, of which 33 percent was used in cement manufacture, 38 percent for calcine, molds, and ceramics, and 29 percent by the chemical industry. Production of calcine was about 700,000 tons.

Lime.—Consumption of slaked and hydraulic lime in 1963 included about 920,000 tons by the chemical industry; 307,000 tons by the iron and steel industry (including 5,052 tons for pig iron and ferroalloy manufacture); and about 250,000 tons by the sugar industry. (Consumption by the construction industry was not available.)

Late in 1961, 670 localities were producing slaked lime and 27 were producing hydraulic lime. Employment was about 5,000. Modernization of quarrying and processing facilities was reported in 1963.

Pumice.—Exports of pumice in 1964 decreased 6 percent in quantity but increased 17 percent in value to about $1.6 million. Domestic consumption was reported to be about 100,000 tons. Most production came from recently modernized quarries and plants in the Lipari Islands.

Pyrite.—Production of pyrite (including cupriferous pyrite) was little changed from the 1963 level although mine employment decreased 6 percent to 2,800 at yearend. As in 1963, the Niccioleta and Gavorrano mines of the Montecatini Co. accounted for practically all production. The company's mines at Calceranica and Brosso were closed in midyear.

Imports of pyrite again increased 11 percent and apparent domestic consumption increased by about 135,000 tons in 1964.

Salt.—Sicilian production of rock salt increased 10 percent in the first half of 1964, to 311,000 tons. The increase was reportedly due to the growing requirements of the chemical fertilizer industry. Increased shipments to the mainland were also reported in 1963. In Agrigento, a new processing plant and loading pier was under construction at Cattolica Eraclea by Società Industria Siciliana del Salgemma. Completion was scheduled for 1965.

Sulfur.—Production of native sulfur in Italy reached a new low in 1964 as rationalization of the industry continued. Declines of 20 to 30 percent were shown in production of crude ore, flotation concentrates, and fused sulfur. Employment also decreased by 20 percent, to about 4,900 at yearend. A turning point in the industry was reached as Italy imported sulfur in quantity for the first time and Sicilian ore was used increasingly for the direct production of acid. Increased imports of sulfur were expected in 1965.

Shipments of crude fused sulfur by the Italian Sulfur Agency (EZI) in 1964 included 48,546 tons to domestic consumers (112,109 tons in 1963) and 2,774 tons to foreign destinations (6,557 in 1963). Stocks at yearend were reduced to 4,243 tons, from 18,069 tons in 1963.

The Montecatini Co. reported production of 1.5 million tons of sulfuric acid in 1964, of which 334,000 tons was produced at the new Follonica pyrite-roasting plant. Output of sulfur ore from the Stincone and Bosco mines in Sicily (90,000 tons) was also used for acid production. The company's Perticara mine on the mainland was closed in April after producing 1,890 tons of sulfur in 1964.

MINERAL FUELS

Consumption of energy in Italy in 1964 increased about 5 percent, to 92 million metric tons of standard coal equivalent.[4] Liquid fuel continued to be the principal energy source and supplied nearly 56 percent of total demand as compared with 13 percent for solid fuels and 10 percent for gas. The remaining 21 percent was provided by hydroelectric power with small contributions from geothermal and nuclear sources.

Domestic production of solid fuels continued to decline in 1964 while output of petroleum and natural gas increased. Imports of solid fuels decreased by 1.4 million tons in 1964, mainly because of reduced demand for steam and gas coals and metallurgical coke. Decreased demand was due to the industrial slowdown as well as to the increasing use of liquid fuel and gas. A 17 percent rise in imports of crude petroleum was accompanied by a slightly greater increase in refinery production, and Italy continued to lead EEC countries in output of petroleum products. Total refinery capacity remained the largest in Western Europe.

Employment in production of mineral fuels was reduced by 12 percent, to 5,832 at yearend.

Government participation in the fuel and power industries was increased in 1964. Ente Nazionale Idrocarburi (ENI), the State hydrocarbons agency, accounted for over 95 percent of oil and gas production, having acquired the Ragusa oilfield in Sicily from the Gulf Oil Corp. in January. Ente per l'Energia Elettrica (ENEL), the state power agency formed by the nationalization law of 1962, was given increased control over electric power production and accounted for 72 percent of electricity generated in 1964. In other Government actions, gasoline taxes were increased in February and a tax on electric power generated by ENEL plants was later established.

Coal.—Coal production again declined in 1964 with decreases of 19 percent in subbituminous (Sulcis) coal and 32 percent in anthracite. Production of anthracite was only 9,360 tons and was not expected to continue. Marketable coal amounted to about 70 percent of total production. Coal production was expected to increase in 1965 as the Porto Vesme thermoelectric plant in Sardinia was nearing completion in November.

Mine employment was reduced to 1,879 by yearend. Productivity increased to an average of 2.53 tons per man-shift (2.0 in 1963) but was paralleled by a 25-percent rise in underground wages. Average direct hourly wages in December were approximately $0.83 for underground and $0.58 for surface workers.

Coal imports decreased 11 percent as compared with 1963. Coking coal made up 62 percent of imports, followed by steam coal (15 percent), anthracite (12 percent), and gas coal (11 percent). Total value was $163 million. Imports from the EEC and Poland were reduced by more than 1 million tons. The United States supplied 95 percent of the coking coal and 72 percent of all coal imported by Italy in 1964.

---

[4] Net domestic production reported by the EEC, using calorific value of 7,000 kilocalories per kilogram. Figure does not include bunkers.

Domestic deliveries of coal totaled 10,285,000 tons, of which 60 percent was for coking purposes, 12 percent for domestic heating, and about 7 percent each for gasworks, railroads, public powerplants, and other uses. In addition, 228,000 tons of coal agglomerates were used for domestic heating.

Coke.—Production of metallurgical coke increased slightly in 1964; however, consumption by industries other than iron and steel was 40 percent less than in 1963 and 420,000 tons remained in producers' stocks at yearend. Production of metallurgical coke by the Cokitalia, Cokapuania, and Vetrocoke companies of the Montecatini group was 1,785,000 tons or 35 percent of total production.

Total consumption of coke was slightly more than 5 million tons, half of which was used by the iron and steel industry and another 192,000 tons by independent foundries.

The coke ovens at the Taranto steelworks were completed by August. Annual productive capacity was reported as 1.1 million tons of blast-furnace coke and 100,000 tons of coke fines.

Electric Energy.—Net production of electric energy in 1964 was approximately 73 billion kilowatt-hours, of which hydroelectric plants accounted for 53 percent, followed by conventional thermoelectric plants (41 percent), geothermal plants (3 percent), and nuclear plants (3 percent). Output from nuclear plants increased sevenfold compared with that of 1963 and was the highest among EEC countries. The reactor at Italy's third nuclear plant at Trino Vercellese near Turin went critical on June 21, 1964. In other developments, new sources of volcanic steam were located near Monte Amiata, 60 miles south of Larderello, and in Sardinia the Porto Vesme thermoelectric plant at Cagliari was expected to become operational near the end of 1964. The plant was to use mine-run coal from Sulcis mines but can also use fuel oil if desired.

TABLE 10.—Italy: Nuclear plants in 1964

Plant	Type of reactor	Installed capacity (megawatts of electricity)	Fuel			
			Type	Initial load (tons)		Consumption in tons U metal per megawatts of electricity per year
				Actual	U metal equivalent[1]	
Latina	Gas-graphite	200	Natural uranium.	250	250	0.095
Garigliano	Boiling water	150	Enriched UO_2.	45	160	.090
Trino Vercellese	Pressurized water	257	Enriched UO_2.	45	160	.090

[1] Taking into account isotopic separation with recovery of 75 percent of U-235.

Source: L'Industria Mineraria (Faenza). Anno 16, sez. 2, No. 2, February 1965, p. 111.

Of the net energy produced by thermoelectric plants in 1964, 80 percent was derived from liquid fuel, 12 percent from gas, and 8 percent from coal and lignite. Fuel consumption included approximately 775,000 tons of coal, 1.2 million tons of lignite, and nearly 6 million tons of fuel oil. Natural gas consumption was equivalent to more than 1 million tons of coal (at 7,000 kilocalories per kilogram).

Lignite.—The decline in lignite production in 1964 was due to reduced output from the Santa Barbara mine and thermoelectric plant in Arezzo. The mine produced 1,289,000 tons of lignite in 1963, with an average calorific value of 1,800 kilocalories per kilogram.

Information on progress of construction at the Mercure project in southern Italy was not available. Construction of the 150,000-kilowatt thermoelectric plant was well advanced in 1963. Mining plans anticipate lignite production at rates up to 1,200 cubic meters per hour.

Lignite deliveries in 1964 included 1,180,000 tons to thermoelectric plants and 315,000 tons of lignite briquets for domestic use.

Petroleum.—The petroleum industry continued to expand in 1964 with increased production and consumption of crude oil, gas, and petroleum products. Italy produced 48 percent of the natural gas, nearly 28 percent of the petroleum products, and 17 percent of the crude oil output of EEC countries. Imports of crude oil continued to be the largest in the EEC and were valued at $782 million. Investment in the industry in 1964 was reported to be $320 million.

Exploration and development activity was again decreased in 1964. The number of exploration permits was reduced by 41 and the number of exploitation permits by 17, primarily by private companies operating in peninsular Italy. Total drilling decreased 20 percent, to about 260,000 meters. Of 108 exploration wells completed, 18 found gas and 2 found oil and gas, but no major discoveries were reported. Most exploration activity was in southeastern Italy and in the Adriatic Sea where Azienda Generale Italiana Petroli (AGIP) Mineraria drilled 10 wells offshore. Development drilling, mainly in peninsular Italy and Sicily, increased gas reserves as well as production capacity. Numerous applications by Italian and foreign companies for exploration permits covering 1,240,000 hectares of offshore areas in the Adriatic Sea were still pending at yearend. The delay in approval appeared to be due to inadequate legislation concerning exploration, drilling, and production in offshore areas and the lack of definition of Italian and Yugoslav territorial rights.

In Sicily, exploration and exploitation of hydrocarbon resources were placed under control of the Sicilian regional administration by a law passed in January. The Sicilian minerals agency, Ente Minerario Siciliano, was given priority rights in all phases of the island's petroleum industry.

In foreign developments, ENI increased oil production in Egypt (to 4.9 million tons) and Iran (to 1.2 million tons) and discovered a small oilfield in Tunisia. Exploration was continued in Nigeria, Libya, and Sudan. In the United Kingdom, AGIP had a 15 percent interest in a consortium for exploration of an offshore area near England's southeast coast. ENI companies continued construction of gas pipelines in India and Pakistan and agreed to participate with Phillips Petroleum Co. and agencies of the Iranian and Indian Governments in Persian Gulf exploration. Construction of a refinery in Tanzania was also begun.

Crude Oil.—Increased production of the Gela oilfield in Sicily was responsible for a 50-percent rise in Italy's output of petroleum in 1964. Production from Gela increased nearly threefold to 1,640,000 tons, while output from Ragusa dropped 16 percent to 937,000 tons. The increased production at Gela was due to the requirements of ENI's new petrochemical plant which came on stream in January. The combined output from Sicily was almost 97 percent of national output, with the remaining 3 percent mostly produced from the Piacenza and Pisticci fields on the mainland. Increased production in Sicily was expected in 1965.

Imports of crude oil increased to nearly 55 million tons, of which about 70 percent originated in the Middle East. Imports from Libya continued to increase and were 9 percent of total imports whereas Soviet deliveries decreased. About 60 percent of deliveries from the U.S.S.R. went to private oil companies and the remainder to ENI. ENI imported 8.9 million tons of crude in 1964, of which 2.1 million tons were produced by the company's foreign operations.

Pipelines.—The $64 million, 150-kilometer oil pipeline from Genoa to Trecate was completed late in September. The 500-millimeter line will supply the SARPOM (Società Anonima Raffineria Padana Olii Minerali) refinery at which the capacity was being increased to 6 million tons per year. SARPOM is a joint venture of the Standard Oil Co. (60 percent) and the California-Texas Co. (40 percent).

The 16-inch, 25-kilometer pipeline from Genoa to Busalla was also completed in June.

Refining and Refinery Products.—Total throughput of crude oil in Italian refineries in 1964 was 57.8 million tons. Refinery output included 51.1 million tons of products for fuel and 3 million tons of other products. As in 1963, the principal commodities were fuel oil (56 percent of total production), gas oil (19 percent), and motor gasoline (14 percent). Output of fuel oil was again the largest among EEC countries. An estimated 84 percent of all refining was done by private companies and the remainder by ENI.

The balance of trade in petroleum products showed a surplus of $66 million as compared with a deficit of $113 million in 1963. Imports of fuel oil were sharply decreased in 1964 and were valued at $193 million as compared with $342 million in the previous year. The value of exports of fuel oil and gas oil increased 16 percent to $203 million.

Domestic consumption of petroleum products again increased by 16 percent, to 37.7 million tons. Fuel oil accounted for 61.5 percent of the total consumption, followed by motor gasoline (14 percent) and gas oil (10.4 percent). Bitumen and liquefied petroleum gas accounted for about 3 percent each and aviation fuels for 2 percent.

Gasoline consumption was slowed by increased taxes and prices increased by about $0.08 per gallon. AGIP, the ENI marketing firm, accounted for 26 percent of all gasoline sales, Esso Standard Italiana for 20 percent, and British Petroleum Co. Ltd. for 19 percent. The number of filling stations in 1964 was estimated at 32,000, of which 75 percent were owned by the major oil companies and the remainder by small firms or individuals.

Italian refining capacity at the beginning of 1964 was 78 million tons of crude oil annually and was estimated to have increased to more than 90 million tons during the year. The increase was mostly due to expansion of existing plants. Two large refineries came on stream in 1964, one at Gela in Sicily (3 million tons annual capacity) and the other at Pavia (5 million tons annual capacity). ENI had a controlling interest in both plants. The Sarroch refinery in Sardinia was expected to go on stream early in 1965; plant capacity was reported to be 5.2 million tons annually. At yearend, plants were under construction at Rome and Taranto, and plant expansion was underway at several locations in northern Italy and Sicily. No new refineries were authorized by the Government in 1964.

Natural Gas.—Increased production of natural gas in the eastern Po Valley, southeastern Italy, and Sicily was responsible for a 6-percent rise in the national output for 1964. Po Valley fields acounted for 95 percent of total production, with substantially increased yields from Bologna, Ravenna, and Modena but reduced output from Cremona and Brescia. The remainder was divided between southeastern Italy (3 percent) and Sicily (2 percent). ENI companies accounted for 98 percent of total production with large increases in output from southeastern Italy (San Salvo-Cupello and Pisticci gasfields) and Sicily (Gagliano field). The Montecatini Co. produced 70 million cubic meters in 1964 from the Cellino field near Pescara.

Development drilling in the Chieti and Foggia areas and in Sicily increased gas reserves in concessions of ENI as well as of private companies. Unconfirmed reports indicated that reserves in peninsular Italy were about 60 billion cubic meters and in Sicily about 50 billion cubic meters.

The pipeline linking the Vasto (Abruzzi) gasfields with Terni and Rome was completed in May. Rome gasworks were consuming 100,000 cubic meters per day in July; the daily quantity had increased to 250,000 cubic meters in September and was expected to reach 500,000 cubic meters in September 1965. Società Nazionale Industria Applicazioni Viscosa announced plans to build a 50-kilometer pipeline from the Candela gasfield to Foggia. The pipeline was to deliver 200,000 cubic meters of gas per day for residential and commercial consumers and for a petrochemicals plant to be built by the company.

Natural Gasoline.—Production of natural gasoline condensate increased substantially for the first time in several years. The increase was due to tripled production (17,587 tons) from the Gagliano gasfield in Sicily. The principal other centers of production in 1964 were Piacenza (35,172 tons) and Modena (8,257 tons).

The Mineral Industry of Luxembourg

By Justin B. Gowen[1]

◆

THE high level of activity attained in 1963 by Luxembourg's heavy industries—predominantly iron and steel—continued throughout 1964. The Grand Duchy's gross domestic product at constant prices reportedly increased by about 6.5 percent over that of 1963 to about $588 million, while the gross value of industrial production at current prices was estimated at more than $600 million, reflecting major increases in output by the steel, energy, nonmetals, and construction sectors of the economy. The chemical industries showed little overall change while decreases were recorded in the extractive (mining and quarrying) industries and in metal fabrication.

PRODUCTION AND FOREIGN TRADE

Luxembourg's production of crude metals and minerals was confined almost entirely to iron ore, iron and steel, and certain nonmetallic minerals consumed in the metallurgical and construction industries.

TABLE 1.—Luxembourg: Production of metals and minerals

(Thousand metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Iron ore	6,977	7,458	6,507	6,990	6,680
Pig iron [1]	3,786	3,834	3,597	3,587	4,191
Crude steel	4,084	4,113	4,010	4,032	4,559
Semimanufactures	3,254	3,290	3,193	3,213	3,589
Nonmetals:					
Cement	210	231	230	202	202
Cement bricks ... thousand pieces	34,819	35,359	34,756	31,047	NA
Clay bricks ... do	5,606	5,563	5,283	5,319	NA
Clay and plaster products	18	19	16	13	NA
Dolomite, calcined	8	NA	NA	NA	NA
Gypsum	8	7	8	5	5
Lime, hydraulic	36	12	3	2	NA
Limestone	161	100	NA	NA	36
Molding sand	34	32	32	30	40
Other sand and gravel ... thousand cubic meters	548	681	633	543	541
Slate and flagstones	6	6	5	5	5
Stone:					
Building ... thousand cubic meters	120	118	69	49	41
Cut, rough ... do	1	1	1	1	5
Rubble ... do	282	380	11	98	184
Fertilizers	780	796	786	767	818
Basic slag	NA	128	124	127	NA
Other phosphates, P_2O_5 content [2]	125	126	125	NA	NA

[1] Official figures, includes some remelted pig iron.
[2] For fiscal years ending June 30 of year stated.
NA Not available.

---

[1] West Europe specialist, Division of International Activities.

Luxembourg's foreign trade statistics are incorporated with those of Belgium under the Belgium-Luxembourg Economic Union. Separate figures for a few major commodities are given in the commodity section of this chapter. However, the gross value of production and percentage of output exported by major industrial sectors is available and may be used as a rough measure of the share of total output exported. In 1963 the gross value of production by the mineral-based industries was about $497 million of which 71 percent was exported. During the same year, exports of iron and steel were valued at about $289 million, representing nearly 95 percent of the total value of iron and steel production and 79 percent of the gross exports for 1963. The estimates of values for 1964 are based on indices contained in the source publication.

TABLE 2.—Luxembourg: Gross value of production and exports by major industrial sector [1]

(Million dollars)

Industrial sector	1961		1962		1963		1964
	Production	Exports	Production	Exports	Production	Exports	Production estimate
Mineral based industries:							
Iron ore	14.0	2.7	13.1	2.5	13.3	2.6	13.0
Slate and stone	3.6	.3	3.5	.5	3.3	.6	3.0
Total extractive	17.6	3.0	16.6	3.0	16.6	3.2	16.0
Iron and steel	338.7	328.2	316.3	304.7	304.5	288.8	344.0
Energy, gas and water	15.6	NA	16.4	NA	25.2	NA	29.0
Chemicals and fertilizers:							
Basic slag	7.3	7.0	8.2	7.8	8.6	8.3	9.0
Other	20.3	16.3	22.4	17.9	32.4	27.5	32.0
Total	27.6	23.3	30.6	25.7	41.0	35.8	41.0
Nonferrous metals	1.4	.6	1.6	.8	1.8	.8	2.0
Metal fabrication	32.3	15.6	33.3	15.5	39.5	18.8	38.0
Nonmetals	12.2	4.5	13.3	4.7	13.9	5.8	15.0
Construction	46.1		55.0		54.8		59.0
Total mineral based industries	491.5	[2] 375.2	483.1	[2] 354.4	497.3	[2] 353.2	544.0
All other industries	61.2	8.0	62.6	8.2	66.6	10.2	66.0
Grand total	552.7	[2] 383.2	545.7	[2] 362.6	563.9	[2] 363.4	610.0

[1] At 1963 prices.

[2] Excludes exports of energy.

NA Not available.

Source: Service Central de la Statistique et des Etudes Economiques (STATEC). Serie A, L'Econoime Luxembourgoise en 1964.

COMMODITY REVIEW

METALS

Iron Ore.—Production in 1964 dropped 4.4 percent below that of 1963 and constituted 42.5 percent of the total iron ore consumed in the country's blast furnaces, compared with 48.5 percent of the iron ore consumed in 1963, while total consumption increased by 8.1 percent. The increased consumption in the face of declining output necessitated increased imports. As in previous years, the bulk of imported ore came from the calcareous minette deposits in France.

Luxembourg's iron ore deposits comprise the northern fringe of the Lorraine iron ore basin, most of which lies in France. The ores consist of calcareous and siliceous minette type iron ores, which are mined separately and, when mixed in the proper proportions, provide a self-fluxing blast furnace feed. However, since the siliceous type of ore predominates the Luxembourg portion of the basin, balances are obtained through imports from France. These imports come largely from mines situated adjacent to or near the Luxembourg border and owned by the Luxembourg steel companies.

Remaining reserves in the Luxembourg deposits at the end of January 1963 were estimated at about 242 million tons, sufficient for more than 30 year's supply at the 1964 rate of extraction.

Reflecting the development of alternative sources of iron ore were the substantial increases in imports from Sweden and from the properties of Aciéries Réunies de Burbach-Eich-Dudelange S.A. (ARBED) in Minas Gerais, Brasil.

Luxembourg's iron ore exports increased by 1.8 percent to 935,536 tons in response to increased requirements in Belgium. About 70 percent of the Grand Duchy's iron ore exports consisted of ore produced from Société John Cockerill's Luxembourg mines which was shipped to the Cockerill-Ogrée SA works in Belgium.

Iron and Steel.—New production records were established in all three major sectors of iron and during 1964 pig iron output increased 16.8 percent, crude steel 13.1 percent, and semimanufactures 11.7 percent. As a result Luxembourg advanced from 15th to 14th in rank among world steel producers. Of the 4,558,542 tons of steel produced during 1964, ARBED accounted for 59.0 percent, Hauts Fourneaux et Aciéries de Differdange-St. Ingbert-Rumelange S.A. (HADIR) 30.8

TABLE 3.—Luxembourg: Iron ore, and manganese ore, salient statistics

(Thousand metric tons unless otherwise specified)

	1960	1961	1962	1963	1964
Number of mines in operation yearend	24	23	23	22	20
Ore production:					
Calcareous (27 to 28 percent Fe)	3,387	3,642	2,930	3,153	2,832
Siliceous (27 to 28 percent Fe)	3,270	3,416	3,131	3,397	3,474
Ferruginous limestone (22 to 23 percent Fe)	320	400	446	440	374
Total	6,977	7,458	6,507	6,990	6,680
Exports:					
Belgium	1,070	962	804	738	760
France	132	189	197	181	176
Total	1,202	1,151	1,001	919	936
Imports:					
France	6,870	6,608	7,122	6,374	7,448
Sweden	56	57	59	65	156
Brazil	---	---	72	26	271
Portugal	---	---	29	23	5
Africa	---	---	---	2	1
Total	6,926	6,665	7,282	6,490	7,881
Consumption:					
Domestic ores	5,902	6,365	5,384	6,091	5,767
Imported ores:					
From ECSC countries	6,836	6,600	7,058	6,313	7,782
From other countries	57	56	124	121	
Total	12,795	13,021	12,566	12,525	13,549
Employment in iron mining, laborers ... persons	2,107	2,030	1,970	1,872	1,771
Production per man-year ... metric tons	3,311	3,673	3,303	3,734	3,772
Gross value of ore produced per ton ... dollars	1.81	1.88	2.01	1.90	NA

NA Not available.

percent, and Société Minière et Métallurgique de Rodange 10.2 percent.

Data on deliveries of crude steel and semimanufactures for further processing or for sale, including material destined for export, by areas of consignment obtained from Office of Statistics, European Communities, Iron and Steel, 1964, 1965, while not classified as official export data, closely approximate Luxembourg's share of Belgium-Luxembourg Economic Union (BLEU) exports to areas outside the European Coal and Steel Community.

During 1964 ARBED invested $28.8 million compared with $25.5 million in 1963. In June a 70-ton capacity LD–AC converter was placed in service at the Schifflange works, and in October a 7.2-meter blast furnace was commissioned at the Belval plant. This new blast furnace "C" uses fuel injection and consequently consumes less coke than other installed equipment and has a rated capacity of 700 to 900 tons of pig iron daily from low-grade ores. Work was also continued on a 8-meter blast furnace and on two LD–AC converters with capacities of 120 tons each at Belval, planned for completion during 1965. Additional projects by ARBED involved modernization of the hot rolling mill at Dudelange, and the installation of more LD–AC converters at various facilities.

In March 1964 HADIR commissioned a new blooming mill at Differdange, and in May the new replacement of No. 1 blast furnace was commissioned. With a daily production capacity of 1,200 tons of pig iron from low-grade ores, this became Luxembourg's largest blast furnace. Work continued on the grey mill for rolling sections, which is scheduled for completion during 1965.

At Rodange the installation of direct oxygen lines to the Thomas converter was completed, as was the spectral analysis laboratory. Finishing mill "C" was modernized by the addition of heavier equip-

TABLE 4.—Luxembourg: Deliveries of steel products by Luxembourg works

(Thousand metric tons)

Destination	1960	1961	1962	1963	1964
Crude steel:					
West Germany	204	152	134	138	174
France	6	3	6	3	4
Italy	33	44	31	31	17
Netherlands	------	------	------	------	------
Belgium	14	6	1	5	24
To Luxembourg works	2	1	2	2	1
Total ECSC	259	206	174	179	220
All other	14	5	1	------	4
Grand total	273	211	175	179	224
Semimanufactures:					
West Germany	732	586	633	661	782
France	203	237	251	242	269
Italy	77	97	124	163	91
Netherlands	238	223	210	187	232
Belgium	514	601	597	503	570
To Luxembourg works	153	202	210	208	213
Total ECSC	1,917	1,946	2,025	1,964	2,157
Other Europe	532	535	523	498	557
United States	202	241	203	265	254
All other	321	363	260	291	390
Grand total	2,972	3,085	3,011	3,018	3,358

Source: Office of Statistics, European Communities. Iron and Steel, 1964, 1965.

ment. Projects involved with the 10-year plan to reorient Rodange production from general lines to specialized steels based on 25-ton LD–AC converters, include the replacement of one Thomas converter with a 25-ton LD–AC converter during 1965.

TABLE 5.—Luxembourg: Iron and steel, salient statistics

(Thousand metric tons unless otherwise specified)

	1960	1961	1962	1963	1964
Sinter:					
Production	2,928	2,966	3,211	4,472	4,776
Consumption of raw materials:					
Iron ore:					
Total	2,921	3,033	3,571	5,336	5 488
Per ton sinter produced kilograms	998	1,023	1,112	1,193	1,149
Coke:					
Total	--------	--------	38	183	216
Per ton sinter produced kilograms	--------	--------	12	41	45
Pig iron:					
Blast furnaces:					
In existence	32	32	33	33	33
In operation at yearend	30	30	29	26	28
Production [1]	3,713	3,775	3,585	3,563	4,178
Consumption of raw materials:					
Iron ore, direct use:					
Total	9,863	9,980	8,968	7,157	8,047
Per ton of pig iron produced kilograms	2,656	2,644	2,502	2,009	1,926
Manganese ore:					
Total	50	60	52	34	42
Per ton of pig iron produced kilograms	13	16	15	10	10
Sinter:					
Total	2,923	2,975	3,190	4,393	4,760
Per ton of pig iron produced kilograms	787	788	890	1,233	1,139
Coke, direct use:					
Total	4,053	4,053	3,792	3,433	3,711
Per ton of pig iron produced kilograms	1,092	1,074	1,058	964	888
Scrap:					
Total	197	214	109	89	157
Per ton of pig iron produced kilograms	53	57	31	25	38
Steel:					
Furnaces in existence and in operation:					
Basic bessemer (Thomas) in existence	25	24	24	25	25
Basic bessemer (Thomas)in operation	24	24	24	24	24
LD–AC oxygen converters in operation	1	1	2	2	3
Electric	5	5	5	5	5
Crude steel production by type:					
Basic bessemer (Thomas)	4,003	4,038	3,881	3,846	4,219
Oxygen blown	(1)	(1)	65	120	271
Electric:					
Total	4,084	4,113	4,010	4,032	4,559
Of which:					
Ingots	4,079	4,108	4,005	4,028	4,553
Castings	5	6	5	4	6
Consumption of raw material:					
Iron ore:					
Total	11	8	27	32	14
Per ton of crude steel kilograms	3	2	7	8	3
Scrap:					
Total	631	612	698	732	811
Per ton of crude steel kilograms	155	152	180	190	192
Coke:					
Total	32	46	46	48	29
Per ton of crude steel kilograms	8	11	12	12	7
Semimanufacturers, production:					
Semifinished for sale as such	243	209	179	185	220
Finished:					
Wire rod	245	220	236	225	223
Other bars and rods	1,107	1,143	1,001	1,031	1,121
Sections	605	646	649	625	719
Plates and sheet coil	394	403	407	437	459
Hot and cold strip	594	587	646	653	801
Railway track material	66	82	75	57	46
Total	3,011	3,081	3,014	3,028	3,369
Total semimanufacturers	3,254	3,290	3,193	3,213	3,589
Employment in the iron and steel industry: Laborers, average monthly [2]	22,004	22,189	22,022	21,748	22,169

---

[1] Excludes remelted pig iron.

[2] Includes ancillary works.

NONMETALS

Fertilizers.—Basic slag obtained as a byproduct from the dephosphorization of pig iron in basic bessemer (Thomas) and LD–AC steel converters continued to be Luxembourg's principal nonmetal product and most important nonmetal export commodity. Some superphosphates also were produced for export, while nitrogen and potash fertilizers continued to be imported. Salient statistics relating to fertilizers were as follows:

(Thousand metric tons unless otherwise specified)

	1960	1961	1962	1963	1964
Basic slag:					
Production:					
Crude	780	796	786	767	818
Ground	732	622	737	818	NA
Value, million dollars	8.6	6.9	7.5	8.2	NA
Exports:					
West Germany	309	206	246	258	NA
France	69	91	178	189	NA
Belgium	115	109	104	94	NA
Netherlands	57	28	53	53	NA
Other countries	124	148	131	181	NA
Total	674	582	712	775	NA
Consumption	40	35	37	35	NA
Other phosphates, P_2O_5 content:					
Production	121	128	124	127	NA
Exports	111	98	98	120	NA
Consumption	6	6	6	6	NA
Potash fertilizers, imports and consumption, K_2O content	6	6	6	6	NA

NA Not available.

MINERAL FUELS

Luxembourg's fuel requirements were supplied entirely from imports which in 1964 increased about 8 percent for coke and 19 percent for petroleum products compared with 1963.

Notable were the increases in production and exchange of electric power, due to the commissioning of additional facilities at the Vianden-Sur-Or hydroelectric plant.

SOURCE MATERIALS

Principal basic sources of information for this report were publications of the Service Central de la Statistique et des Études Économiques (STATEC), including Annuaire Statistique 1964, Cahiers Économiques No. 35, Series A, L'Économie Luxembourgoise en 1964; and Bulletin du STATEC. Additional data on iron and steel as well as energy were derived from publications of the Office of Statistics, European Communities, which included The Iron and Steel Yearbook 1964, The Iron and Steel bimonthly issues for 1965; and Energy 1964. Some supplementary statistical information was obtained from the United Nations Monthly Bulletin of Statistics; details on developments were reported in U.S. Embassy dispatches and in various professional journals.

TABLE 6.—Luxembourg: Fuels and energy, salient statistics

(Thousand metric tons unless otherwise specified)

	1960	1961	1962	1963	1964
Solid fuels:					
Coal and briquets:					
Imports by type:					
Bituminous	154	124	110	104	147
Anthracite	91	87	94	113	
Lignite briquets	135	137	141	152	153
Other briquets	9	9	9	11	8
Total	389	357	354	380	308
Imports by origin:					
West Germany	293	282	289	310	277
Belgium	42	43	41	29	19
France	48	26	20	17	3
Netherlands	6	5	4	8	5
Deliveries to consuming industries:					
Iron and steel	27	21	21	22	15
Other industries	39	36	33	30	22
Domestic sector	237	233	241	267	233
Railroads	45	22	17	19	--------
Gasworks	41	45	42	42	39
Total	389	357	354	380	309
Coke:					
Production: Gas coke from imported coal	34	33	32	32	31
Imports from:					
West Germany	3,520	3,597	3,451	3,255	3,450
Belgium	237	240	226	236	276
Netherlands	383	312	281	185	237
Total	4,140	4,149	3,958	3,676	3,963
Deliveries to consuming industries:					
Iron and steel	4,106	4,116	3,919	3,627	3,930
Other industries	9	7	7	8	6
Domestic sector	25	26	32	42	28
Total	4,140	4,149	3,958	3,677	3,964
Petroleum products:					
Imports:					
Gasoline	56	67	72	75	76
Kerosine and white spirits	2	3	3	2	6
Gas oil and diesel oil	106	128	163	206	581
Fuel oil	42	49	143	269	--------
LP gases	9	11	13	14	12
Lubricants	7	8	8	8	9
Bitumen	4	5	10	5	7
Total	226	271	412	579	691
Electricity:					
Production:					
Thermal ..... thousand kilowatt-hours	1,444	1,471	1,415	1,279	1,335
Hydro ..... do	20	57	110	486	793
Total ..... do	1,464	1,528	1,525	1,765	2,128
Imports: [1]					
Belgium ..... do	29	26	138	338	401
France ..... do	52	14	15	9	--------
West Germany ..... do	--------	--------	89	623	1,088
Total ..... do	81	40	242	970	1,489
Exports: [1]					
Belgium ..... do	36	47	9	--------	--------
France ..... do	36	16	16	38	23
West Germany ..... do	--------	--------	63	463	771
Total ..... do	72	63	88	501	794
Gross domestic consumption ..... do	1,473	1,582	1,679	2,323	2,908

[1] Data represent power delivered to consumers, and do not include transmission losses.

The Mineral Industry of the Netherlands

By Stephen C. Brown[1]

◆

OUTPUT of the Netherlands mineral and mineral processing industries again increased substantially in 1964; production of the natural gas and steel industries increased markedly, while production of most nonferrous metals and nonmetallic minerals also rose. Coal production declined slightly, and production of crude petroleum showed a modest increase. The petroleum refining industry continued its rapid growth as new refineries and expansion programs were begun. Investments in the mining sector of the economy nearly quadrupled, rising from $31.9 million in 1963 to $121.7 million in 1964.

Although no data are available for value of net output, it is apparent that the mineral and mineral processing industries of the Netherlands continued to grow more rapidly than the economy as a whole. The gross national product of the country is estimated to have increased about 7.5 percent in 1964, after a 5.5 percent rise in the previous year; by comparison, the physical volume of output of two important mineral industries (steel and natural gas) increased by 13 percent and 45 percent, respectively, in 1964.

Except for coal, natural gas, and salt, the Netherlands continued to depend chiefly on imports of mineral raw materials; thus the mineral processing sector was the most important part of its mineral industry. In 1961, the latest year for which data are available showing the share of gross domestic product accounted for by the extractive industries, this sector accounted for only 1.8 percent of total output. The rise of the natural gas industry since that year has undoubtedly increased this percentage. Employment in the mineral industries probably totaled about 100,000 to 120,000 in 1964 out of an employed nonagricultural labor force of 1,138,000. Employment in the mining and quarrying sector alone was 56,610, while that in the metallurgical industries totaled 33,356.

Both imports and exports of mineral commodities rose significantly, but foreign trade in minerals did not quite keep pace with the rise in value of the Netherlands' total foreign trade. The value of imports of mineral commodities remained at about 23 percent of total imports, but exports of minerals and mineral products as a percentage (by value) of total exports fell slightly from 18 percent to about 17.5 percent. The large and important transit trade in minerals, which accounts for more than three-fourths of the Netherlands' total transit trade, rose by 15 percent, with minerals participating fully in the rise. The large entrepôt trade in petroleum and petroleum products continued at a high level, with entries of crude in bond increasing by 10 percent and withdrawals of crude from bond by somewhat more, but both entries and withdrawals of refined products declined from 1963 levels; for the second year in a row withdrawals of refined products exceeded entries.

---

[1] International economist, Division of International Activities.

Exploration for natural gas continued actively; new discoveries were made in the Frisian Islands and in North Holland (south of the Ijsselmeer), and 525 miles of natural gas pipeline were laid, including 305 miles of high pressure main lines. Agreements were signed with Belgian and West German distributing companies for exports of natural gas to those countries, while negotiations were carried on with British and French entities concerning exports of Netherlands gas to those countries. Legislation was introduced to govern the licensing of exploration concessions in the Netherlands area of the Continental Shelf of the North Sea but was still pending at yearend.

GOVERNMENT POLICIES AND PROGRAMS

The major event of 1964 with respect to Government mineral policies was the introduction of legislation to govern the granting of exploration and concession licenses in areas of the North Sea Continental Shelf subject to Netherlands jurisdiction under the terms of the 1958 Geneva Convention. The new "Mining Act, Continental Shelf," which was introduced into the legislature on June 9, 1964, basically provides that all minerals in or on the Netherlands sector of the Continental Shelf are the property of the State, but that once a production license has been granted, the rights pass to the concession holder. Exploration for or production of minerals in these areas cannot be made without express permission of the Ministry of Economic Affairs; such permission will be given in the form of licenses. One of the provisions of such licenses will be that the Government is to receive certain revenues and royalties.

Under the draft bill, implementing regulations were to be issued by an Order in Council, a Royal Decree, or a Ministerial Ruling, for which Parliamentary approval is not required. The bill was the subject of much debate and was still pending at yearend. It was, however, expected to be enacted before the end of 1965; and, similarly, the Netherlands Government was expected to ratify the Geneva Convention on the Continental Shelf. The Netherlands Government was said to take the view that its jurisdiction over the Continental Shelf is an inherent right of a riparian State and does not depend on the Geneva Convention; nevertheless it announced that it would not license exploration or production in Continental Shelf areas outside territorial waters until the new mining legislation had been approved and the Convention ratified.

Another policy decision with respect to the natural gas industry was the establishment of a schedule of gas prices for industrial use by the N. V. Nederlandse Gasunie (Netherlands Gas Union) and the Commission Samenwerkende Regionale Organen Gasvoorziening (Cooperating Regional Organizations for Gas Supply), in agreement with the Minister of Economic Affairs. This price schedule went into effect on October 1, 1964. A special price remained to be fixed for electric power companies, the largest consumers of coal. According to reports, this price is not likely to be as favorable as the "industrial price." For other industries, the schedule fixes prices on a competitive basis to attract a maximum of industrial users, and is to be related to an index of the prices of imported heavy fuel oil, to be published annually by the Central Bureau of Statistics. Contracts are to be for a minimum of 10 years, with the price adjustable annually in accordance with fluctuations in the above-mentioned index. Industrial consumers in the three northern provinces of Groningen, Friesland, and Drenthe receive a discount of two-tenths of a Netherlands cent per cubic meter as an incentive for industrialization and in view of their nearness to the gasfields of Groningen.

In the field of commercial policy, licenses for imports of foreign coal from non-European Coal and Steel Community countries for consumption by electric power companies were temporarily suspended in mid–1964, reportedly to assure markets for Netherlands and other Coal and Steel Community mines. The suspension was lifted in early 1965.

PRODUCTION

Production of the more important metals and minerals increased substantially in 1964. Output of crude steel rose by 13 percent, of refined lead by 46 percent, of zinc by 5 percent, of salt by 8 percent, of cement by 38 percent, of crude petroleum by 2.5 percent, of refined petroleum products by 15 percent, and of natural gas by 45 percent. Coal production declined slightly. Output of the Arnhem tin smelter, resuming large-scale production after the renewal of imports of concentrates from Indonesia, increased two and three-quarters times to 15,858 long tons. Data are not available for production of secondary aluminum and secondary copper. Output of the former probably was in the neighborhood of 6,000 tons, the figure reported for recent years by an authoritative West German trade source.[2] Despite a known capacity of some 14,000 tons for secondary copper, no estimates of output are available; the trade source referred to above indicates, however, an estimated consumption of 40,000 tons of scrap copper in 1963, the most recent year for which an estimate is available.[3]

In 1964, official reporting of natural gas output was shifted from a production basis to a deliveries for sale basis, and the figures in the production table have been revised accordingly.

Complete data are not available for total fertilizer production, but the evidence appears to indicate a modest rise in output. Similarly, although data are not available to show a complete breakdown of the output of refined petroleum products, the figure for total output shows a 15 percent rise from 22.3 million metric tons in 1963 to 25.6 million tons in 1964.

---

[2] Metallgesellschaft A.G. Metal Statistics 1954–63, p. 7.

[3] Page 19 of work cited in footnote 2.

TABLE 1.—Netherlands: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1960	1961	1962	1963	1964
Metals:					
Aluminum, secondary, including alloys...thousand tons..	[r] 6	[r] 6	[r] 6	[r] 6	NA
Cadmium metal [e]	40	40	40	40	40
Iron and steel:					
Sinter...thousand tons..	968	1,805	1,995	2,355	2,787
Pig iron...do....	1,347	1,457	1,571	1,709	1,947
Steel ingots and other primary forms [2]...do....	1,942	1,971	2,087	2,342	2,646
Castings:					
Iron...do....	225	230	230	216	238
Steel...do....	8	9	9	9	8
Rolled steel...do....	1,429	1,442	1,555	1,759	1,908
Lead:					
Pig lead	12,691	10,817	9,577	11,864	17,315
Semimanufactures, including alloys...thousand tons..	17	17	18	16	18
Tin...long tons..	6,393	2,729	4,282	5,762	15,858
Zinc	36,080	39,592	37,049	35,762	37,702
Other nonferrous	2	1	1	1	NA
Nonmetals:					
Cement...thousand tons..	1,798	1,903	2,015	2,081	2,873
Fertilizers:					
Nitrogenous, N content...do....	412	410	417	421	451
Phosphate, P_2O_5 content...do....	207	200	[r] 182	174	201
Potassic, K_2O content	1,300	1,600	2,600	[r] 2,500	NA
Salt...thousand tons..	1,096	1,114	1,262	1,479	1,596
Sulfur...do....	31	[r] 28	[r] 31	[r] 35	35
Mineral fuels:					
Coal and coal products:					
Anthracite and bituminous...do....	12,498	12,621	11,573	11,509	11,480
Coal briquets...do....	1,177	1,282	1,369	1,561	1,355
Coke and semicoke, including gas coke [3]...do....	4,809	4,787	4,474	4,447	4,623
Lignite...do....	4	-------	-------	-------	-------
Lignite briquets...do....	63	74	71	63	66
Tar...do....	158	161	144	140	NA
Benzol...do....	50	54	52	52	NA
Gas, manufactured...million cubic feet..	158,610	155,326	154,281	154,000	157,328
Gas, natural [4]...do....	11,124	14,620	16,068	18,576	27,016
Petroleum:					
Crude...thousand tons..	1,918	2,046	2,157	2,215	2,270
Refinery products:					
Aviation jet fuels...do....	805	1,171	965	857	976
Motor gasoline...do....	3,215	2,944	3,501	3,827	2,769
Kerosine...do....	836	722	950	970	955
Solvents...do....	120	132	158	167	178
Residual fuel oil...do....	8,045	8,484	9,636	10,155	10,943
Distillate fuel oil...do....	4,456	4,743	5,465	5,164	6,025
Lubricants...do....	206	259	246	245	251
Bitumens...do....	385	469	469	584	681
Liquefied petroleum gas...do....	267	295	332	[r] 334	362
Refinery gas...do....	143	161	193	204	166

[e] Estimate. [r] Revised. NA Not available.

[1] Carbon black has been produced in recent years, but no current data are available.

[2] Including liquid steel for castings.

[3] Including breeze.

[4] Deliveries for sale.

TRADE

The foreign trade of the Netherlands in minerals and mineral products, like its foreign trade as a whole, remained of major importance to its economy. Its true extent is not fully revealed by the statistics of domestic imports and exports; to these should be added the statistical data of the entrepôt trade (in the case of minerals important only with respect to petroleum commodities), and of the transit trade, which is about 65 million tons per year, mineral commodities accounting for more than three-fourths of this. The detailed trade tables relate to domestic imports and exports only.

Both imports and exports of mineral commodities rose in total value, the former by 17.5 percent and the latter by 14 percent; mineral imports maintained their relative share of total imports at about 23 percent, while the relative share of mineral exports in the total declined slightly from about 18 percent to 17.5 percent of the total. Imports of iron and steel increased by 33 percent in value, of nonferrous metals by 36 percent (reflecting both price and quantity increase), and of crude petroleum and refined products by 11 percent, while imports of coal, coke, and briquets (the other major mineral category) declined by 5 percent. On the export side, all four major categories of minerals increased in value, iron and steel by 5 percent, nonferrous metals by 90 percent, crude petroleum and refined products by 5 percent, and coal, coke, and briquets by 5 percent.

In absolute terms, the value of mineral imports increased from $1,390 million in 1963 to $1,640 million in 1964, while the value of mineral exports rose from about $900 million in 1963 to $1,033 million in 1964. Crude petroleum and refined products accounted for the major share of both imports and exports in both years, iron and steel, solid fuels, and nonferrous metals following in that order. In 1964, imports of crude petroleum and refined petroleum products were valued at $611 million, or about 37 percent of total mineral imports and a little over 8.5 percent of total imports; exports of the same commodities were valued at $411 million, accounting for 40 percent of mineral exports and about 7 percent of total exports. By value, iron and steel accounted for 24 percent of mineral imports and 21 percent of mineral exports; solid fuels (coal, coke, and briquets) accounted for 10 percent of mineral imports and 11 percent of mineral exports; and nonferrous metals accounted for 10 percent of mineral imports and 10 percent of mineral exports.

The entrepôt trade in crude petroleum and refined petroleum products is of considerable importance in the petroleum refining industry of the Netherlands. Apparently it is the practice to import large quantities of crude in bond, withdraw it for refining as necessary, and re-enter a portion of the refined products in bond until sales are made. Similarly, large quantities of products refined elsewhere are entered in bond until markets are found. The products which account for the bulk of the trade in refined products are distillate and residual fuels. The principal sources of entries in 1964 were Venezuela, Trinidad, Italy, the United Kingdom, Belgium, and the U.S.S.R. for distillate; the principal destinations of this commodity in 1964 were West Germany, the Netherlands, Sweden, Denmark, and Norway, with a substantial portion going to undesignated countries. For residual fuels, the principal sources were the Netherlands, Venezuela, Netherlands Antilles, Trinidad, Belgium, and the United Kingdom, while the principal destinations were the Netherlands, the United Kingdom, Norway, Denmark, and Sweden.

Entrepôt trade in other mineral commodities is negligible.

TABLE 2.—Netherlands: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Metals:				
Aluminum:				
Bauxite	645	843	149	West Germany 111.
Alumina	33	44	49	France 14; Venezuela 7; Belgium-Luxembourg 5.
Scrap	4,854	7,396	8,985	West Germany 7,947; Belgium-Luxembourg 971; France 35.
Ingot [1]	784	91	753	West Germany 391; Belgium-Luxembourg 134; United Kingdom 128.
Semimanufactures	8,058	8,814	13,716	West Germany 3,777; Belgium-Luxembourg 3,472; France 869; Italy 515.
Bismuth, scrap and semimanufactures.	151	181	141	France 51; West Germany 31; Italy 13.
Cadmium, all forms	177	246	186	West Germany 115; France 31; Belgium-Luxembourg 20.
Chromite	1,121	1,476	1,272	Italy 645; France 165; Yugoslavia 119; Spain 104; West Germany 89.
Copper:				
Ore	267	-----	-----	
Scrap	17,616	20,000	24,474	West Germany 13,975; Belgium-Luxembourg 9,873; France 316; Sweden 231.
Unwrought [1]	5,645	5,572	7,585	West Germany 5,599; Belgium-Luxembourg 673; Yugoslavia 423.
Semimanufactures	7,758	9,006	13,700	West Germany 5,265; Belgium-Luxembourg 3,537; France 1,719; Sweden 1,363.
Iron and steel:				
Ore ..... thousand tons	[r] 11	[r] 7	3	Mainly to West Germany.
Pyrite cinder ..... do	122	120	249	West Germany 218; United Kingdom 27; Belgium-Luxembourg 3.
Scrap ..... do	234	282	423	West Germany 310; Belgium-Luxembourg 66; France 31.
Pig iron and ferroalloys.[2] ..... do	204	[r] 146	95	West Germany 32; Belgium-Luxembourg 25; France 20; United Kingdom 9.
Ingots and other primary forms. ..... do	8	35	84	Belgium-Luxembourg 75; United Kingdom 5; West Germany 1; France 1.
Rolled steel ..... do	916	1,350	1,424	West Germany 309; Italy 202; United Kingdom 196; Belgium-Luxembourg 156.
Forged and drawn products. ..... do	39	42	24	Rep. of South Africa 9; West Germany 4; United States 2.
Tubes and fittings ..... do	147	117	123	West Germany 34; Belgium-Luxembourg 12; United States 12; Sweden 4.
Lead:				
Scrap	2,726	3,247	8,430	Belgium-Luxembourg 7,531; West Germany 826; Italy 59.
Pig [1]	6,042	5,629	7,639	West Germany 7,265; East Germany 85; Austria 85; Sudan 60.
Antimonial and other alloys	1,279	[r] 1,711	1,576	West Germany 911; Belgium-Luxembourg 152; Austria 142; France 120.
Semimanufactures	2,368	2,836	1,846	United States 816; Norway 250; Belgium-Luxembourg 214; West Germany 107.
Magnesium, all forms	257	373	243	United Kingdom 69; West Germany 60; Italy 52; United States 35.
Manganese ore	5,680	7,095	8,592	Italy 1,648; West Germany 1,137; Belgium-Luxembourg 1,126; France 526.
Mercury ..... 76-pound flasks	[r] 522	[r] 116	203	Yugoslavia 58; Belgium-Luxembourg 58; West Germany 29.
Nickel:				
Scrap	992	1,548	1,559	West Germany 584; United Kingdom 568; Sweden 100; Belgium-Luxembourg 83.
Ingots, anodes and semimanufactures.[1]	254	305	277	West Germany 140; France 31; Belgium-Luxembourg 26; Spain 22.
Platinum and platinum-group, unwrought and semimanufactures. ..... troy ounces	41,539	47,551	33,887	Switzerland 14,693; West Germany 8,037; United Kingdom 2,572.
Silver:				
Scrap and waste.[3] ..... thousand troy ounces	2,164	1,433	3,101	West Germany 1,455; Belgium-Luxembourg 1,062; United Kingdom 34.
Unwrought [1] ..... do	2,799	1,724	588	West Germany 26.
Semimanufactures ..... do	511	353	362	Denmark 219; Belgium-Luxembourg 64; United Kingdom 39.

See footnotes at end of table.

TABLE 2.—Netherlands: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Metals—Continued				
Tin:				
Ore .... long tons	--------	[r]44	548	United Kingdom 547.
Ingots [1] .... do	4,661	4,853	14,419	West Germany 7,388; France 2,590; United States 1,065; Italy 988.
Scrap and semimanufactures. .... do	586	807	690	West Germany 226; Italy 150; Belgium-Luxembourg 107.
Zinc:				
Ore	3,880	3,870	8,161	Japan 3,106; France 2,829; Belgium-Luxembourg 1,362; Poland 865.
Scrap	7,804	7,955	9,287	France 8,322; Italy 395; Belgium-Luxembourg 308; West Germany 182.
Slab [1]	21,276	23,481	25,821	West Germany 15,673; Denmark 2,114; Japan 1,976; Italy 1,760; United Kingdom 1,303.
Semimanufactures	1,192	1,300	1,353	Denmark 437; West Germany 378; Turkey 250; Norway 137.
Other nonferrous ores	252	666	865	West Germany 312; United Kingdom 161; Belgium-Luxembourg 154.
Other nonferrous metals and scrap [1]	249	271	355	West Germany 129; Belgium-Luxembourg 72; France 45; United Kingdom 33.
Nonmetals:				
Abrasives, natural	4,272	4,273	9,471	West Germany 5,974; France 603; Belgium-Luxembourg 231.
Asbestos	58	122	17	Belgium-Luxembourg 4.
Borates, natural	--------	20	85,545	West Germany 38,463; United Kingdom 16,832; France 12,778; Spain 5,400; Austria 2,970.
Cement	4,851	7,894	9,059	West Germany 4,928; Netherlands Antilles 1,175; Sudan 1,000; Belgium-Luxembourg 926.
Chalk	13,305	14,709	13,125	Belgium-Luxembourg 12,739.
Clays:				
Kaolin	45	98	212	Italy 80; Belgium-Luxembourg 6.
Refractory	[r]2,075	[r]1,257	2,094	Belgium-Luxembourg 761; Sweden 660; West Germany 306; Denmark 125.
Other .... thousand tons	102	102	111	West Germany 81; Belgium-Luxembourg 21; France 8.
Diamond and other gem stones:				
Diamond, unworked and worked. .... thousand carats	959	1,464	1,078	NA.
Diamond powder .... do	651	671	695	France 166; West Germany 156; Italy 109; Belgium-Luxembourg 58; Japan 41.
Other gem stones, unworked and worked. .... kilograms	103	94	941	West Germany 29; Denmark 16; Hong Kong 2.
Diatomaceous earth	109	113	94	West Germany 56; Belgium-Luxembourg 26.
Feldspar and leucite	2,327	4,268	5,114	Belgium-Luxembourg 4,793; Australia 155; France 81.
Fertilizers:				
Nitrogenous:				
Natural .... thousand tons	14	11	--------	
Manufactured .... do	671	565	455	United Kingdom 77; Rhodesia 49; Rep. of South Africa 49; Sweden 45; Ireland 36.
Phosphatic:				
Phosphate rock	3,654	3,505	1,324	Nigeria 539; Thailand 250; Venezuela 154; Belgium-Luxembourg 110.
Superphosphate and other. .... thousand tons	370	376	465	France 155; West Germany 11; Belgium-Luxembourg 1.
Potassic	1,161	1,374	1,038	Belgium-Luxembourg 276; Morocco 149; Ceylon 99; Cambodia 99.
Other .... thousand tons	277	260	285	Cuba 26; France 19; Kenya 7; Belgium-Luxembourg 6; Yugoslavia 5; Jamaica 5.
Kyanite and andalusite	7,462	1,426	1,920	West Germany 524; France 480; Belgium-Luxembourg 361; Italy 259.
Lime and limestone	1,709	1,412	2,985	Belgium-Luxembourg 2,247; West Germany 211; Surinam 115.
Magnesite	31,370	36,614	38,836	West Germany 8,805; Belgium-Luxembourg 1,211; France 645.
Mica	112	157	178	Belgium-Luxembourg 123; West Germany 37.
Pyrites	2,683	--------	--------	
Quartz and quartzite	2,419	2,036	2,408	Belgium-Luxembourg 1,591; West Germany 691; Switzerland 108.

See footnotes at end of table.

TABLE 2.—Netherlands: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Nonmetals—Continued				
Salt thousand tons	736	863	959	Belgium-Luxembourg 321; Sweden 289; Finland 128; Norway 117.
Sand:				
Industrial do	400	343	243	West Germany 83; Italy 70; United Kingdom 31; Belgium-Luxembourg 27; Spain 5.
Construction do	4, 767	5, 173	6, 080	Belgium-Luxembourg 5,852; West Germany 126; France 101.
Slate	1, 662	1, 984	2, 767	Belgium-Luxembourg 2,303; West Germany 398; Switzerland 23.
Stone, other:				
Dimension	r337	r586	1, 323	Belgium-Luxembourg 900; West Germany 356; Italy 28.
Crushed rock thousand tons	r1, 771	r2, 624	2, 158	Mainly to Belgium-Luxembourg.
Gravel do	1, 919	1, 748	2, 212	Belgium-Luxembourg 1,700; West Germany 511.
Sulfur	5, 153	6, 949	4, 493	Belgium-Luxembourg 2,983; Switzerland 1,476.
Talc and steatite	196	162	146	West Germany 25; Belgium-Luxembourg 16.
Other	807	382	646	West Germany 340; Belgium-Luxembourg 82.
Mineral fuels:				
Coal:				
Anthracite and bitumen. thousand tons	2, 332	2, 572	2, 158	France 983; Belgium-Luxembourg 866; West Germany 250; Switzerland 30.
Coal briquets do	620	769	776	West Germany 300; France 257; Belgium-Luxembourg 184; Austria 13.
Lignite briquets do	39	34	40	West Germany 23; France 12; Belgium-Luxembourg 4; Italy 1.
Peat do	56	51	43	Belgium-Luxembourg 19; West Germany 14; France 8.
Coke and semicoke do	2, 223	2, 118	2, 327	France 1,037; Belgium-Luxembourg 735; West Germany 227; Sweden 90; Switzerland 80.
Gas, manufactured. thousand cubic feet	11, 308	26, 646	78, 541	All to West Germany.
Distilled products. thousand tons	77	77	89	Belgium-Luxembourg 40; West Germany 20; Italy 3; Sweden 2.
Petroleum: [4]				
Crude do	3	--------	7	Belgium-Luxembourg 6.
Refinery products:				
Gasoline [5] do	2, 865	2, 795	3, 021	United Kingdom 1,151; West Germany 456; Sweden 343; Denmark 236.
Kerosine, including jet fuel. do	641	577	[5] 657	United Kingdom 286; Sweden 98; Denmark 65.
Distillate fuel oils do	3, 124	2, 636	2, 477	West Germany 1,537; Bunkers 358; Belgium-Luxembourg 252; Sweden 105.
Residual fuel oils do	6, 593	5, 582	6, 390	Bunkers 2,823; Belgium-Luxembourg 959; West Germany 940; United Kingdom 595; Denmark 363.
Lubricants do	292	264	329	United Kingdom 43; Belgium-Luxembourg 42; Sweden 35; Italy 28; Yugoslavia 19; West Germany 18.
Paraffin, jelly, etc do	16	18	22	West Germany 10; France 1; Norway 1; mainland China 1.
Petroleum coke do	55	56	58	United Kingdom 33; Italy 13; France 11
Bitumen, bituminous mixtures, and other derivatives. do	261	428	401	West Germany 303; Switzerland 29; Sweden 18; Norway 8; Denmark 8.
Natural gas and other gaseous hydrocarbons.[6] thousand tons	174	181	205	Belgium-Luxembourg 136; West Germany 20; United Kingdom 12; Denmark 10.
Carbon black	31, 599	37, 064	45, 527	France 12,405; Sweden 8,612; Belgium-Luxembourg 4,819; West Germany 4,632.

---

r Revised. NA Not available.

[1] Includes alloys.

[2] Includes sponge iron, shot, grit, pellets, and powder.

[3] Includes all precious metals.

[4] Includes bunkers for foreign ships and aircraft; data for 1962 and 1963 from the Statistical Office of the European Communities, Foreign Trade/Analytical Tables; excludes reexports from bonded warehouses.

[5] Converted from liters given in official trade statistics. Conversion factors: 1 liter equal to 0.00629 barrel; 8.5 barrels gasoline per ton; 7.75 barrels kerosine per ton.

[6] Believed to consist almost entirely of liquefied petroleum gas.

TABLE 3.—Netherlands: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Metals:				
Aluminum:				
Bauxite	1,701	10,368	4,330	Greece 2,902; British Guiana 1,197; West Germany 151.
Alumina	7,967	7,810	9,054	West Germany 8,837.
Scrap	2,077	2,180	2,972	Belgium-Luxembourg 965; United States 829; Ireland 282; France 246.
Ingots	11,225	14,129	15,099	France 5,799; United States 4,014; Canada 2,862; U.S.S.R. 606.
Alloys	3,534	5,685	7,274	West Germany 3,184; France 1,353; Switzerland 1,279.
Semimanufactures [1]	17,011	22,682	29,732	Belgium-Luxembourg 11,387; West Germany 7,979; France 3,950; Switzerland 2,455.
Antimony, unwrought and semimanufactures.	341	386	294	Belgium-Luxembourg 85; mainland China 63; West Germany 54; Czechoslovakia 46.
Bismuth, unwrought and scrap	93	105	157	United Kingdom 62; United States 26; South Korea 26; West Germany 21.
Cadmium, unwrought and scrap	216	189	177	Belgium-Luxembourg 79; U.S.S.R. 50; Bulgaria 14; United States 8; Poland 8.
Chromium:				
Ore	2,339	2,700	2,772	Rep. of South Africa 752; Philippines 524; Portuguese East Africa 508; Turkey 301.
Unwrought and semimanufactures.	14	16	17	France 10; United Kingdom 4; West Germany 3.
Cobalt, unwrought and semimanufactures.	142	122	164	Belgium-Luxembourg 115; France 20; West Germany 16; United Kingdom 7.
Copper:				
Scrap	4,924	8,386	8,703	West Germany 4,540; Belgium-Luxembourg 2,867; France 596; Netherlands Antilles 177.
Unwrought [1]	23,245	27,898	36,789	Belgium-Luxembourg 13,991; United States 8,036; United Kingdom 4,195; Rhodesia 4,012; Congo (Leopoldville) 3,050.
Semimanufactures [1]	40,072	39,924	58,616	Belgium-Luxembourg 33,928; West Germany 15,663; United Kingdom 2,793.
Iron and steel:				
Ore ... thousand tons	2,317	2,522	3,048	Sierra Leone 787; Liberia 749; Sweden 696; Spain 233; Brazil 204.
Pyrite cinder	2,966	14,423	13,027	West Germany 6,004; Italy 3,398; Belgium-Luxembourg 3,625.
Scrap ... thousand tons	83	90	44	Belgium-Luxembourg 25; West Germany 8; United Kingdom 6; France 3.
Pig iron and blast furnace ferroalloys.[2] do	27	51	110	West Germany 55; Norway 10; Sweden 10; France 6.
Other ferroalloys ... do	8	7	8	Norway 4; West Germany 1; U.S.S.R. 1; United Kingdom 1.
Ingots and other primary forms. do	59	98	144	Norway 59; West Germany 41; Italy 11; United States 10; France 10.
Rolled steel ... do	1,561	1,773	2,105	Belgium-Luxembourg 922; West Germany 870; France 120.
Forged and drawn products. do	134	136	67	Belgium-Luxembourg 38; West Germany 21.
Tubes and fittings ... do	202	216	431	West Germany 229; France 45; Belgium-Luxembourg 45; United Kingdom 45.
Lead:				
Scrap	1,197	3,708	5,180	West Germany 3,430; Belgium-Luxembourg 426; Norway 329; Canada 266.
Pig [1]	42,521	33,372	37,930	Belgium-Luxembourg 9,626; Rep. of South Africa 6,557; Mexico 3,655; Australia 3,251.
Antimonial and other alloys	8,027	7,204	11,125	Mexico 9,243; Belgium-Luxembourg 1,218; Australia 523.
Semimanufactures	2,350	2,708	3,708	Belgium-Luxembourg 2,573; France 362; West Germany 110.

See footnotes at end of table.

TABLE 3.—Netherlands: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Metals—Continued				
Magnesium:				
Scrap	20	94	53	Norway 9; Ireland 7; United Kingdom 5; Austria 3; Belgium-Luxembourg 3.
Unwrought	314	393	208	Norway 146; United States 49; United Kingdom 10.
Semimanufactures	64	76	122	West Germany 62; United Kingdom 21; Switzerland 18; Belgium-Luxembourg 6.
Manganese ore	37,238	12,927	16,827	Ghana 3,005; India 2,778; U.S.S.R. 2,695; Morocco 2,086; Portugal 1,398.
Mercury 76-pound flasks	r 1,450	r 1,828	2,002	Italy 725; mainland China 522; Belgium-Luxembourg 348.
Nickel:				
Scrap	453	876	910	Belgium-Luxembourg 231; West Germany 200; France 190; United Kingdom 113.
Ingots and anodes [1]	719	775	976	United Kingdom 464; Norway 358; West Germany 47.
Semimanufactures [1]	1,273	1,362	1,905	West Germany 1,120; United Kingdom 412; Switzerland 113; Canada 58.
Platinum and platinum group, unwrought and semimanufactures. troy ounces	60,990	77,998	65,780	France 34,498; U.S.S.R. 25,303; Czechoslovakia 4,964.
Silver:				
Scrap and waste.[3] thousand troy ounces	240	431	339	Canada 233; Denmark 94.
Unwrought [1] do	4,726	3,895	3,039	United States 1,137; United Kingdom 897; Belgium-Luxembourg 496.
Semimanufactures do	2,209	2,242	2,648	West Germany 923; France 816; United Kingdom 695.
Tin:				
Ore long tons	7,648	7,929	28,782	Indonesia 19,542; Thailand 5,717; Bolivia 1,811.
Ingots [1] do	2,710	3,083	1,502	Mainland China 399; United Kingdom 300; United States 238.
Scrap and semimanufactures. do	136	201	241	West Germany 104; Belgium-Luxembourg 81; Switzerland 31.
Zinc:				
Ore	73,758	76,767	105,594	Finland 23,787; Canada 18,800; West Germany 15,663; Peru 12,106.
Scrap	322	431	253	Belgium-Luxembourg 121; West Germany 105.
Slab [1]	16,767	15,907	15,834	Belgium-Luxembourg 5,584; U.S.S.R. 4,858; West Germany 2,129; Norway 1,167.
Semimanufactures	4,938	6,562	8,002	Belgium-Luxembourg 4,939; United Kingdom 1,507; West Germany 1,222.
Other nonferrous ores	15,704	4,570	13,429	Rep. of South Africa 7,010; Australia 3,040; Norway 1,203; United Kingdom 809.
Other nonferrous metals and scrap [1]	r 78	r 97	207	United States 56; France 36; West Germany 29; United Kingdom 15.
Nonmetals:				
Abrasives, natural thousand tons	447	479	448	West Germany 436; Italy 7; Turkey 5.
Asbestos	16,968	16,644	23,276	Canada 19,231; Portuguese East Africa 1,476; Rep. of South Africa 819.
Barite	22,654	14,314	37,071	West Germany 23,347; Morocco 3,195; Greece 3,030; Spain 2,664.
Borates, natural	3,831	3,500	92,182	All from United States.
Cement thousand tons	1,452	1,410	1,847	Belgium-Luxembourg 985; West Germany 826.
Chalk	57,090	53,624	70,769	Belgium-Luxembourg 38,578; France 22,758; West Germany 9,017.
Clays:				
Kaolin thousand tons	102	112	130	United Kingdom 113; West Germany 7; Czechoslovakia 3.
Refractory do	r 65	r 75	75	West Germany 53; United Kingdom 10; Belgium-Luxembourg 5.
Other do	319	345	455	West Germany 426; Belgium-Luxembourg 13; United States 7.
Cryolite and chiolite	272	386	210	All from Denmark.
Diamond and other gem stones:				
Diamond, unworked and worked. thousand carats	1,305	1,827	1,438	NA.
Diamond powder do	507	539	597	United Kingdom 348; Belgium-Luxembourg 104; United States 62; Ireland 54.
Other gem stones, unworked and worked.[4] thousand kilograms	20	52	161	West Germany 158; Brazil 2; United Kingdom 1.

See footnotes at end of table.

TABLE 3.—Netherlands: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Nonmetals—Continued				
Diatomaceous earth	7,576	6,649	8,180	Hungary 2,869; France 1,291; West Germany 1,195; United States 939.
Dolomite ... thousand tons	254	264	314	Belgium-Luxembourg 272; West Germany 33; Norway 8.
Feldspar and leucite	19,933	28,913	28,946	Norway 9,535; Sweden 6,601; West Germany 6,482; Canada 3,810.
Fertilizers:				
Nitrogenous:				
Natural ... thousand tons	28	33	17	All from Chile.
Manufactured ... do	99	122	3	Belgium-Luxembourg 2; West Germany 1.
Phosphatic:				
Phosphate rock ... do	565	675	810	Morocco 547; Togo 96; Senegal 68; U.S.S.R. 45; United States 37.
Basic slag ... do	146	155	234	Belgium-Luxembourg 185; West Germany 49.
Superphosphate and other ... do	78	62	103	United States 79; Belgium-Luxembourg 16; France 7.
Potassic ... do	380	405	482	West Germany 215; France 97; Belgium-Luxembourg 68; East Germany 53.
Other ... do	65	50	47	Belgium-Luxembourg 27; United States 11; France 6; United Kingdom 3.
Fluorspar	11,113	8,842	14,472	Mainland China 5,476; Rep. of South Africa 3,840; West Germany 1,763; Portuguese East Africa 1,028.
Graphite	396	392	364	Austria 174; West Germany 143 United Kingdom 32.
Gypsum ... thousand tons	140	153	247	West Germany 168; France 47; Belgium-Luxembourg 16; Morocco 14.
Kyanite and andalusite	6,997	3,011	4,700	India 1,427; United States 884; South Africa 778; United Kingdom 622.
Lime ... thousand tons	469	473	594	West Germany 299; Belgium-Luxembourg 271; Poland 24.
Limestone ... do	655	709	769	Belgium-Luxembourg 767; West Germany 2.
Magnesite	36,678	40,368	52,120	Greece 32,213; India 7,686; Yugoslavia 5,709; Czechoslovakia 1,915.
Mica	710	630	793	United Kingdom 370; Norway 207; India 104.
Pigments, natural	2,249	2,394	1,043	France 520; Austria 200; West Germany 116.
Pyrite ... thousand tons	249	226	244	Cyprus 115; Spain 94; Portugal 11; Italy 10; Norway 9.
Quartz and quartzite	14,660	18,698	32,825	Norway 12,174; Belgium-Luxembourg 11,660; West Germany 6,943.
Salt	24,081	62,830	34,987	West Germany 25,202; France 6,895; Italy 2,282.
Sand ... thousand tons	928	1,348	2,121	West Germany 1,327; Belgium-Luxembourg 794.
Slate	19,378	22,157	32,939	West Germany 17,355; France 6,438; Norway 5,975.
Stone, other:				
Dimension ... thousand tons	r 32	r 45	47	Belgium-Luxembourg 15; West Germany 9; Italy 8; France 3; Czechoslovakia 3.
Crushed rock ... do	r 1,266	r 1,141	1,552	Belgium-Luxembourg 1,235; West Germany 268.
Gravel ... do	3,417	4,815	6,914	West Germany 3,905; Belgium-Luxembourg 2,847; France 161.
Sulfur ... do	124	137	167	United States 96; France 65; Mexico 4; West Germany 1.
Talc and steatite	12,012	13,646	13,715	Norway 6,658; Austria 2,087; mainland China 1,809; France 1,665.
Mineral fuels:				
Coal:				
Anthracite and bituminous ... thousand tons	8,923	9,949	9,299	United States 3,297; West Germany 3,158; United Kingdom 1,340; Belgium-Luxembourg 802.
Coal briquets ... do	135	200	93	West Germany 85; Belgium-Luxembourg 7; United Kingdom 1.
Lignite ... do	215	191	204	All from West Germany.
Lignite briquets ... do	241	265	160	West Germany 139; East Germany 21.
Peat ... do	65	59	75	Mainly from West Germany.
Coke and semicoke ... do	361	524	310	West Germany 255; United Kingdom 46; Belgium-Luxembourg 5.
Distillation products ... thousand tons	114	174	155	West Germany 38; Belgium-Luxembourg 29; United Kingdom 20; U.S.S.R. 19; Sudan 10.

See footnotes at end of table.

TABLE 3.—Netherlands: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Mineral fuels—Continued				
Gas, manufactured. million cubic feet..	784	1,062	322	West Germany 246; Belgium-Luxembourg 76.
Petroleum: [5]				
Crude..........thousand tons..	19,928	20,890	23,438	Kuwait 5,152; Syria 4,332; Lebanon 3,285; Libya 2,478; Iran 2,074; Venezuela 1,878.
Refinery products:				
Gasoline..............do....	111	124	[6] 285	Belgium-Luxembourg 118; Netherlands Antilles 113; West Germany 32.
Kerosine, including jet fuel. do....	239	341	[6] 350	Belgium-Luxembourg 203; Netherlands Antilles 34; Italy 33.
Distillate fuel oils.....do....	1,005	1,252	1,388	Belgium-Luxembourg 350; Italy 233; Venezuela 152; Trinidad 110; West Germany 100.
Residual fuel oils...do....	3,622	2,514	3,748	Indonesia 1,205; West Germany 1,081; United Kingdom 444; Netherlands Antilles 263; Belgium-Luxembourg 261.
Lubricants...........do....	155	167	196	United States 57; Belgium-Luxembourg 43; Netherlands Antilles 35; United Kingdom 24; West Germany 18.
Paraffin, jelly, etc...do....	21	20	29	United States 10; Indonesia 7; West Germany 7; France 2.
Petroleum coke.......do....	14	40	52	Mainly from United States.
Bitumen, bituminous mixtures, and other derivatives. do....	188	244	223	United States 101; Belgium-Luxembourg 87; West Germany 31.
LP gases..............do....	77	82	102	West Germany 77; Belgium-Luxembourg 24.
Carbon black..............	4,633	9,118	10,472	West Germany 3,780; United States 3,163; France 1,729; United Kingdom 1,218.

[r] Revised. NA Not available.

[1] Including alloys.

[2] Including sponge iron, shot, grit, pellets, and powder.

[3] Including all precious metals.

[4] Including articles of piezo-electric quartz.

[5] Includes bunkers for Netherlands ships and aircraft: 1962 and 1963 data from Statistical Office of the European Communities, Foreign Trade/Analytical Tables; excludes deliveries to bonded warehouses.

[6] Converted from liters given in official trade statistics. Conversion factors: 1 liter equal to .00629 barrel; 8.5 barrels gasoline per ton; 7.75 barrels kerosine per ton.

TABLE 4.—Netherlands: Entrepôt trade in crude petroleum and refinery products

(Thousand metric tons)

Commodity	Entries in bond		Withdrawals from bond	
	1963	1964	1963	1964
Petroleum:				
Crude	30,225	33,397	29,546	33,440
Refinery products:				
Gasoline	1,543	1,662	1,586	1,927
Kerosine	445	597	387	661
Distillate	6,997	6,946	8,476	7,125
Residual	9,344	8,474	8,362	8,213
Lubricants	91	83	94	83
Bitumen, mixtures	(1)	----------	(1)	----------
Other derivatives	33	24	27	39

[1] Negligible.

Source: Centraal Bureau voor de Statistiek, Maandstatistiek van de In-, Uit-en Doorvoer per Goederensoort, December 1964.

Mineral commodities comprise the bulk of the very large transit trade, which increased by 15 percent from 61.5 million tons in 1963 to 72 million tons in 1964. In both the total transit trade and the transit trade in mineral commodities, approximately two-thirds of the total undergoes transshipment in the Netherlands. The volume of the transit trade in mineral commodities rose from 48.1 million tons in 1963 to 55.4 million tons in 1964; values are not given in the official statistics. The chief commodities in 1964 were iron ore (including roasted pyrites), 18.7 million tons; coal, 7.1 million tons; iron and steel, 5 million tons; crude petroleum and refined petroleum products, 4.2 million tons; phosphates and other fertilizers and fertilizer materials, 4.6 million tons; nonferrous ores and metals, 3.1 million tons; and unroasted pyrites, 1.6 million tons.

COMMODITY REVIEW

METALS

Aluminum.—In early 1964 construction began on the Aluchemie N.V. anode plant in the Botlek harbor area of Rotterdam. The $25 million plant was scheduled for completion by the end of April 1965. A new company, Aluminum Delfzijl N.V., was formed by Aluswisse, Hoogovens (Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V., Ijmuiden) and N.V. Billiton Maatschappij, and the firm began construction of a primary aluminum plant at Delfzijl in Groningen Province with an initial capacity of 30,000 tons per year and planned for an expansion to 60,000 tons annually. Production at this plant was scheduled to start in the second half of 1966. Hoogovens and Billiton, in their annual reports for 1964, indicate that construction was going forward on schedule. Meanwhile, Hoogovens, which holds 50 percent of the shares of Aluminium Delfzijl, acquired full control of N.V. Industrie Vaassen, described as an important producer of aluminum castings and foil, in late 1964.

Columbium and Tantalum.—N. V. Kawecki-Billiton Metaalindustrie, producer of columbium and tantalum, is reported to have increased output in 1964 but failed to produce satisfactory results. The European market for tantalum anodes and tantalum and columbium sheet and foil is said to be developing slowly, and Billiton (the Dutch partner in the firm) reports that the manufacture of master alloys based on aluminum offers better prospects.

Iron and Steel.—Netherlands production of crude steel rose by 13 percent in 1964 to over 2.6 million tons, while pig iron production increased by 14 percent. Rolled steel output increased by 8 percent to 1.9 million tons. Apparent consumption of crude steel, according to European Economic Community data, increased by nearly 900,000 tons to 3,964,000 tons, and imports increased accordingly. The steel industry worked at 87.6 percent of capacity, which increased by 11 percent during the year.

Koninklijke Nederlandsche Hoogovens en Staalfabrieken N. V. Ijmuiden (Royal Netherlands Blast Furnaces and Steelworks), together with its affiliate, Breedband N.V., increased output and capacity in practically all lines. A billet mill was put into operation in June 1964, and a bar and rod mill in November, completing the unit for production of nonflat steel. All five of Hoogovens' blast furnaces were in operation, and plans were announced for construction of a sixth blast furnace of 10 meters hearth diameter and a capacity of 1 million tons of pig iron annually; this new furnace is to be completed and put into operation in 1968. Plans have also been made to extend

TABLE 5.—Netherlands: Salient iron and steel industry statistics

(Thousand metric tons unless otherwise specified)

	1962	1963	1964
Number of blast furnaces:			
Available	5	5	5
In operation	4	4	5
Pig iron production:			
Martin	1, 258	1, 502	1, 743
Foundry	313	207	205
Total	1, 571	1, 709	1, 948
Pig iron capacity	1, 725	1, 825	2, 225
Raw material consumption for pig iron production:			
Iron ore directly in blast furnaces	522	370	321
Iron ore in sintering plants	1, 782	2, 205	2, 594
Total	2, 304	2, 575	2, 915
Sinter in blast furnaces	1, 987	2, 341	2, 773
Manganese ore in blast furnaces	42	23	11
Scrap (in independent foundries)	7	7	6
Coke in blast furnaces	1, 101	1, 123	1, 214
Coke in sintering plants	43	104	104
Raw material consumption per ton of pig iron produced:			
Coke kilograms	700	657	624
Sinter do	1, 265	1, 370	1, 424
Number of steelworks:			
Martin:			
Available	10	10	10
In operation	6	6	5
Electric:			
Available	8	8	8
In operation	8	8	8
Crude steel production:			
Martin	805	697	587
Electric	205	209	216
Oxygen	1, 076	1, 434	1, 841
Total	[1] 2, 087	[1] 2, 342	[1] 2, 646
Crude steel capacity	2, 538	2, 927	3, 250
Raw material consumption of steelworks:			
Pig iron, spiegeleisen and ferroalloys	1, 232	1, 509	1, 815
Scrap	1, 061	1, 078	1, 132
Iron ore	12	12	16
Consumption per ton of crude steel produced:			
Pig iron kilograms	591	644	686
Scrap do	517	470	431
Rolled steel production:			
Strip	64	76	84
Sheet and plate	1, 274	1, 387	1, 456
Coil	63	111	149
Wirebar	127	132	152
Other	27	46	68
Total	[1] 1, 553	1, 752	1, 909
Tinplate and other coated steel production	212	248	270
Tube production	141	145	175
Wire production	133	136	148
Steel consumption:[2]			
Total quantity	3, 050	3, 077	3, 964
Per capita kilograms	259	257	327
Total employment, workers and staff, end of year	9, 875	10, 149	11, 511

[1] Detail does not add to total because of rounding.
[2] Including products not covered by ECSC Treaty.

Source: Statistical Office of the European Communities, Iron and Steel, 1965, No. 3.

wharfing facilities to permit the discharge alongside of ore shipments of up to 80,000 tons. A significant development was the further growth in the proportion of total steel output in 1964 produced by the oxygen process; 1.8 million tons, or 79 percent of Hoogovens' crude steel output, was produced by this process. According to the company's annual report, the production capacity of its oxygen-blown melting shop was raised to over 2 million tons per annum.

Breedband increased its output of hot-rolled coils by 15 percent, of cold-reduced products by 103,000 tons, and of tinplate by 23,000 tons. Despite the rise in output, the company's profits declined because of lower average selling prices (due in part, according to the company, to the British Government's 15 percent surcharge on import duties), and because of rising costs of raw materials (mainly due to tin price increases).

During the year Hoogovens acquired the share holdings of the Netherlands Government and of Algemeene Bank Nederland N.V. in Breedband, and now holds the entire capital stock of the latter company. Hoogovens also acquired almost complete control of Koninklijke Demka Staalfabrieken N.V., Utrecht, increasing its shareholdings in that firm from 51 percent to 99 percent of the outstanding capital. Demka, a producer of steel ingots, wire, wire products, and special steels, has a technical assistance arrangement with Carpenter Steel Co. and is intensively working to build up production of special and stainless steels. Production data are not available, but the company is believed to have produced practically at capacity during 1964.

Hoogovens' annual report indicates long-range plans for expanding and modernizing the capacity of its two major affiliates. Production at Breedband's hot-strip mill is said to have reached the limit of capacity, and the mill is expected to require replacement by 1970. Hoogovens' 1964 annual report states that in view of the long time required for construction, detailed plans are being worked out and a decision will be made "in the near future" regarding a modern plate and sheet mill with a capacity for rolling roughly 4 million tons of ingot steel for annum.

N.V. Nederlandsche Kabelfabrieken in 1964 put into operation its new slabbing mill at Ablasserdam, and its new electric furnace is expected to go into operation in 1965. No production data are available, but reports indicate that financial results of the company's steelworks operation were unsatisfactory despite higher production, due to a rise in wage costs. The supply of steel wire and steel strip for the company's own cable production is said to account for not more than 8 percent of production capacity.

Consideration of the proposed Rozenburg steel project in the Rotterdam Europoort area continued during the year but without definite decision. On May 29, 1964, the City Council of Rotterdam approved an agreement with Koppers International, C.A., authorizing the U.S. company to develop a definite project for the establishment of a new integrated steel mill, to be built on a new site to be reclaimed from the sea. The previously considered site at Rozenburg was to be sold. The agreement is to lapse in 4 years if a definite project is not submitted within that period, or if the Municipality rejects Koppers' proposed project for any of a variety of cited reasons.

TABLE 6.—Netherlands: Iron and steel production of Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V. and Breedband N.V.

(Thousand metric tons)

Product by company	1962	1963	1964
Hoogovens:			
Pig iron	1,571	1,709	1,947
Steel ingots:			
Oxygen	1,074	1,434	1,840
Open hearth	702	595	482
Total	[1] 1,775	2,029	[1] 2,323
Plates	384	369	386
Bars	-----	-----	10
Cast iron pipes	26	18	25
Breedband:			
Coils, hot-rolled	1,046	1,283	[2] 1,474
Coils, cold-reduced	151	171	217
Sheets, hot-rolled	69	84	95
Sheets, cold-reduced	464	431	488
Coils and sheet, rolled on commission	43	166	NA

NA Not available.

[1] Detail does not add to total because of rounding.

[2] Excluding commission rolling.

Source: Annual Reports of Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V. (Royal Netherland Blast Furnaces and Steelworks), Ijmuiden, and Breedband N.V., Ijmuiden, 1964.

Molybdenum.—In September 1964, American Metal Climax, Inc., announced plans for the construction, by its Climax Molybdenum Division, of a $5 million plant at Rotterdam for the conversion of molybdenum concentrate to products. Reported capacity of the proposed plant is 5,400 metric tons; it is due for completion in early 1966.

Tin.—With full-scale resumption of Indonesian shipments of tin concentrates in 1964, N.V. Billiton's Arnhem smelter regained its former position as one of the world's major producers of refined tin. Netherlands imports of concentrates totaled 28,782 long tons, of which 19,542 came from Indonesia, and output of refined tin increased by 175 percent to 15,858 long tons. The balance of the concentrates used originated in Thailand (5,717 long tons), Bolivia (1,811 long tons), and various other countries. The capacity of the Arnhem smelter was reported insufficient to handle all ores offered, and plans are on hand to increase it.

Titanium.—Cyprus Mines Corp. of Los Angeles, California, sold its 22.5 percent interest in N.V. Titann Dioxydefabriek to its partner in the firm, Koninklijke Zout-Ketjen of Hengelo, the Netherlands. N.V. Titann owns a 10,000-ton TiO_2 plant at Rotterdam. Koninklijke Zout-Ketjen and its other partner, Billiton, now share full ownership of N.V. Titann. The plant operated at full capacity in 1964. Plans for expansion were in preparation.

MINERAL FUELS

Coal.—Production of coal in Netherlands mines declined slightly from 1963 levels, and stocks at the mines rose to the highest levels since 1959 as total internal deliveries declined by over 1 million tons. Public utilities and household users, two of the most important classes of consumers, each decreased their takings by more than 500,000 tons. Higher prices for European Coal and Steel Community coal (including Netherlands coal) and strong competition from imported United States and other non-ECSC coal affected the public utilities market, while the milder winter of 1963–64 and increasing competition from natural gas affected the market among household users. A rise in the consumption of coal by coking plants was insufficient to offset losses in other markets.

Apparently in an effort to protect the markets of Netherlands and other ECSC coal mining industries, the Netherlands Government in June temporarily suspended licensing of coal imports from non-EEC countries by public utilities; this suspension was lifted early in 1965. The price policy for sales of natural gas to industrial consumers, under which public utilities will be required to negotiate special contracts with Gasunie rather than benefiting from the general industrial price schedule announced in October 1964, also suggested to observers that an effort would be made to retain the public utilities market for the coal industry.

Petroleum and Natural Gas.—Intensive and highly competitive exploration and drilling for petroleum and natural gas resources continued in the Netherlands during 1964, with particular emphasis on the search in the Frisian Islands and the Province of North Holland. Independently or in combination, some 12 oil companies were engaged in exploration in the Netherlands or Netherlands territorial waters. The Netherlands Government has decided not to issue licenses for drilling in areas of the Netherlands sector of the Continental Shelf until the pending legislation regulating the issue of licenses is passed and the Geneva Convention ratified. Nederlandsche Aardolie Maatschappij (NAM) discovered commercially exploitable natural gas on the island of Ameland, and in North Holland near Middelie, where reserves are estimated at some 10,000 million cubic feet. Socony Mobil Oil Co Inc. (Mobil) discovered commercially exploitable gas at De Hon, on the eastern part of the Island of Ameland, and a consortium composed of Standard Oil Co. of Indiana (Amoco), Steenkolen Handelsvereniging, and Gelsenkirchener Bergwerk, made a find, believed to be commercially exploitable, near Groote Schermer, North Holland. All three firms have made conflicting applications for concessions, in each case the applications of NAM overlapping that of the others. The Ministry of Economic Affairs must resolve these conflicting claims before production can begin.

Petroleum.—Crude petroleum output expanded by about 2.5 percent in 1964.

Four petroleum refineries were in operation in the Netherlands in 1964, as compared with three in 1963; work began on doubling the size of the fourth (Gulf Oil Corp.) even before it was completed, and plans were announced in 1964 for two more. Esso Nederland undertook a modernization of its Rotterdam refinery intended to increase annual capacity from 6 million to 8 million tons by the end of 1964. British Petroleum Co. Ltd. announced a 4 million ton-per-year refinery at Rotterdam, construction of which is to begin in 1966, scheduled for completion in 1968. Mobil announced plans for an 4.2 million ton-per-year refinery in the Amsterdam area; final approval by the Netherlands authorities was not, however, obtained by yearend.

TABLE 7.—Netherlands: Salient coal and coal products statistics

(Thousand metric tons unless otherwise specified)

	1962	1963	1964
Coal:			
Production:			
Anthracite	5,056	5,572	6,402
Bituminous, medium to high volatile	6,504	5,935	5,078
Per work day ...tons	45,900	45,900	46,700
Per man shift ...do	2,117	2,137	2,208
Received from EEC	4,583	4,089	3,542
Delivered to EEC	2,245	2,276	1,961
Stocks at mines, end of year	537	378	898
Consumption, deliveries:			
Coking plants	5,723	5,173	5,761
Public utility plants	4,752	4,905	4,366
Domestic, commercial	3,994	4,862	4,306
Briquet plants	1,186	1,484	1,289
Mines, electricity generation	1,100	1,039	1,113
Industry	1,046	889	681
Coal mines, own consumption	435	477	517
Gas plants	231	188	99
Transportation	45	37	NA
Other	47	99	NA
Total	18,559	19,153	18,132
Employment:			
Mines, underground	26,400	25,300	25,200
Mines, surface	14,900	14,800	14,400
Related installations	8,000	7,900	8,200
Technical personnel	5,100	5,100	5,200
Other	2,900	2,800	2,800
Total	57,300	55,900	55,800
Coal briquets:			
Received from EEC	126	146	86
Delivered to EEC	587	728	749
Total internal deliveries	770	774	954
Lignite:			
Deliveries to thermal plants after briquetting	160	151	158
Consumption at briquet plants	50	44	44
Received from EEC	221	227	130
Total internal deliveries	283	302	NA
Coke, coke oven:			
Received from EEC	330	449	251
Delivered to EEC	1,766	1,668	1,987
Internal deliveries:			
Iron and steel industry	1,151	1,174	1,400
Domestic, commercial	1,022	1,006	591
Other	538	544	368
Total	2,711	2,724	2,359
Coke, gas plant:			
Production	201	178	NA
Stocks at gas plants	48	64	NA
Total internal deliveries	190	144	NA
Consumption at gas plants	148	126	NA

NA Not available.

Sources: Statistical Office of the European Communities. Coal and Other Energy Sources. 1965, No. 2; Energy Statistics. 1965, No. 3.

According to EEC statistics, refinery throughput in the Netherlands totaled 28.5 million metric tons of crude in 1964, and output of refined products totaled 26.3 million tons. Domestic consumption of products was 15.9 million tons.

Natural Gas.—Work was begun in April 1964 on construction of the first phase (460 kilometers) of the planned 1,000 kilometers of main high-pressure pipeline to distribute Groningen natural gas throughout the Netherlands. Pressure in these lines is to be at 67 atmospheres. The first phase, divided into four sections for which contracts were let separately, consists of the following network:

Section number	Terminal points	Distance (kilometers)	Pipe diameter (inches)
1	Hoogezand-Zutphen	130	36
2	Ommen-Utrecht	110	36
3	Zutphen-Boxtel	110	36
4	Ravestein-Geleen	110	24

According to the 1964 annual report of Shell—N. V. Koninklijke Nederlandsche Petroleum Maatschappij (Royal Dutch Petroleum Co.), 220 miles of 36-inch pipe, 85 miles of 24-inch pipe, and some 220 miles of smaller diameter interconnecting lines were laid across the Netherlands in 1964 for distribution of gas from the Slochteren field. An additional 275 kilometers of pipeline construction was announced for 1965 by Gasunie.

Domestic consumption of natural gas for heating is reported to have increased considerably. Five hundred thousand new connections are planned for 1965, and there are expected to be 1 million connections by the end of 1965 or about 40 percent of the total of 2.6 million connections planned. The 1964 annual report of Standard Oil Co. of New Jersey indicates that Groningen gas was being delivered to consumers at the rate of 100 million cubic feet per day at the end of 1964. The schedule of prices for industrial gas consumers announced by Nederlandse Gasunie in October 1964 is as follows:

Annual consumption (cubic meters)	Price per cubic meter in Netherlands guilders[1]		
	Fixed price	Flat rate	Total price
300	0.2000	0.0900	0.29
600	.2000	.0450	.245
100,000	.0475	.0480	.0955
200,000	.0475	.0240	.0715
500,000	.0475	.0096	.0571
1,000,000	.0450	.0075	.0525
2,000,000	.0450	.00375	.04875
5,000,000	.0450	.0015	.0465
10,000,000	.0450	.00075	.04575

[1] 1 guilder=$0.276.

NAM's technical specifications of the Groningen gas describe it as consisting of 81.9 percent methane, 3.3 percent other hydrocarbons, 14 percent nitrogen and 0.8 percent carbon dioxide, having a gross caloric value of 7,980 kilocalories per cubic meter and a net caloric value of 7,200 kilocalories per cubic meter.

Large-scale consumers in the Provinces of Groningen, Friesland, and Drenthe will be given a discount of 0.2 Dutch cents per cubic meter in view of their nearness to the gasfield and as an encouragement to industrialization of these provinces.

NAM Gas Export (NAM 50 percent, Shell 25 percent, and Esso 25 percent) in May 1964 announced the signing of a provisional 20-year contract with Distrigaz, a private Belgian gas distribution company, to supply central and western Belgium with Groningen gas. Negotiations for a similar contract to supply eastern Belgium were underway with Savgaz of Liège. Exports to Distrigaz are expected to reach 3 billion cubic meters per year by 1975; first deliveries are scheduled for 1966.

In September 1964, NAM Gas Export announced the conclusion of a similar 25-year contract with Thyssensche Gas and Wasserwerke G.m.b.H. of Duisburg-Hamborn, West Germany, providing for the export of approximately 4 billion cubic meters of gas per year to West Germany. Deliveries are to begin in 1966.

In both the Distrigaz and the Thyssensche Gas contracts, the agreement provides that NAM's co-owners, Shell and Esso, will each take a 25 percent participation in the Belgian and West German enterprises.

Negotiations for the export of natural gas were reported to be underway during the year with other West German firms, with the French Gas Board, and with the British Gas Council.

NAM's export price under these contracts is not known, but reports in the British press concerning the negotiations with the British Gas Council suggested that it was in the neighborhood of six pence ($0.07) per therm, a price regarded as too high to compete with gas produced from petroleum in the United Kingdom.

The chairman of Esso's parent company, Standard Oil Co. of New Jersey, speaking to the Netherlands Club in New York in early 1964, forecast that by 1975 the Groningen gasfield would supply about one-third of the energy requirements of the Netherlands, and that an equal quantity would be exported to other countries of Western Europe. Reserves of the Groningen field are now estimated at 1.1 trillion cubic meters.

Nuclear Power.—Plans were made in 1964 for the Netherlands' first nuclear powerplant, a 50-megawatt station at Doodewaard in Gelderland. Construction was to begin early in 1965, and the plant is expected to be in operation in 1968. Design and technological assistance are to be provided by General Electric Co. It is understood that this project does not foreshadow a significant shift to nuclear power as a source of energy, requirements for which will be amply covered for many years by the Netherlands' natural gas resources.

SOURCE MATERIALS

The Jaarcijfers voor Nederland (Statistical Yearbook of the Netherlands), the Maandschrift van het Centraal Bureau voor de Statistiek, the Maandstatistiek van de Industrie, and the Maandstatistiek van de In-, Uit- en Doorvoer, per Goederensoort, all published by the official Centraal Bureau voor de Statistiek, were the sources of statistical data on production and foreign trade. Supplementary use was made of the publications of the Statistical Office of the European Communities, especially Iron and Steel, Energy Statistics, and Foreign Trade/Analytical Tables. Dispatches from the U.S. Embassy and consular posts in the Netherlands provided much of the information on current developments. Trade journals of the mineral and metal industries provided useful additional information. Annual reports of Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V., N. V. Billiton Maatschappij, N.V. Koninklijke Nederlandsche Petroleum Maatschappij (Shell), and Standard Oil Co. of New Jersey also were helpful.

The Mineral Industry of Norway

By J. M. West[1]

◆

LIMITED as it was in mineral resources, Norway had a valuable hydroelectric capability estimated by the Norwegian Watercourse Electricity Board at 16,442 megawatts of economically installable capacity. The world's highest per capita consumer of electricity, virtually all from hydro sources. Norway utilized over two-fifths of the output in its extensive electrometallurgical and electrochemical industries, which depended mainly on imported crude and semiprocessed minerals. Production of electricity, a good indicator of industrial activity, rose to 44 billion kilowatt-hours in 1964, compared with 40.2 billion kilowatt-hours in 1963.

Through intensive use of hydropower and maintenance of a high level of technology and skilled labor, Norway held an important place in world production of metals and alloys. The main ones, in percent of total, were magnesium 15; aluminum 4; ferroalloys 10 (estimated); nickel 8; electrolytic zinc 4 (estimated); and cobalt 4. These were derived from imported raw materials, except for domestic iron ore and silica that were used in ferroalloys, and for some of the zinc ores that were refined to metal. Domestic resources largely supplied the following, with percentages of world output: Magnesium 14 to 15; ilmenite 14; columbium, tantalum 4; feldspar 4; talc 4; and pyrites 3.5. The bulk of Norway's mineral products were exported and did not enter into domestic manufacturing. The country ranked as the world leader in exports of ferroalloys, magnesium, and feldspar, and ranked near the top in exports of aluminum, titania, nickel, electrolytic zinc, columbium-tantalum, and talc. Production and processing of minerals continued to be an important economic activity, contributing an estimated 4 to 5 percent of the gross national product. The electrometallurgical industry alone employed 26,000 workers, produced products valued at about $400 million, and accounted for about one-fourth of Norway's total export of goods. Another 9,000 workers were employed by 450 companies in mining and quarrying operations; of the latter companies, however, only 27 were engaged in purely ore mining.

Expansion in aluminum refining capacity was foremost among developments during the year. Nearly every plant in the country was being expanded or was scheduled for expansion. The new smelter of Sør-Norge Aluminium A/S, on Hardanger Fjord near

---

[1] Physical scientist, Division of International Activities.

Bergen, was nearing completion, and the A/S Alnor plant in which the U.S. firm Harvey Aluminum Co. had an interest began construction at Karmøy. The former was scheduled for operation in 1965 and the latter in 1967. During 1966–69, investment of roughly $150 million was planned in the aluminum industry, which would nearly double its 1964 capacity. The hydroelectric construction program accompanying such expansion was scheduled to increase total power output by one-third. Yearly requirements for imported alumina to permit the rising aluminum output were expected to reach nearly 1 million tons by 1970.

Other developments included startup of a coking plant at the steel center of Mo-i-Rana, and initial ore production from the large nearby Rana open pit iron mine. Capacity was expanded at the A/S Norsk Jernverk electric steel plant, but operational costs continued to be high. A titanium pigment plant was completed at Fredrikstad, a silicon carbide plant at Orkdal, and a lubricant oil refinery at Valløy, and although several pyrite mines were closed, a new one was being opened at Hjerkinn. Interest heightened in offshore oil possibilities, and, while the Government prepared guidelines and discussed international jurisdictional agreements, private companies began to establish exploration bases.

GOVERNMENT POLICIES AND PROGRAMS

The Government continued to dominate mineral activities through its extensive ownership of plants and facilities. It maintained outright ownership or control of the major portion of the iron ore output, iron and steel production, aluminum output, and several other mineral commodities of lesser importance. Profits coming from government operations were sharply contrasting; although the iron ore and aluminum industries provided considerable earnings, the Government's steel plant at Mo-i-Rana continued to operate at a loss. An attempt was being made to remedy the problem, and a committee was appointed to investigate corrective measures. Several solutions included refinancing combined with a possible working arrangement with private steel companies, combination with Norsk Koksverk A/S, the Government's new coking facility that also was in difficulty, and purchase of the power source, the Røssaaga hydroelectric plant, to reduce operating expenses.

Governmental investment policy was characterized by findings of the Storting (Norwegian Parliament) Industrial Committee in its report submitted in November 1963 to the Department of Industry, in which the committee summarized the extent and effects of foreign investment in Norway.[2] The report, endorsing the Government's policy, stressed that capital should be obtained by loans rather than by direct investment, the benefits of foreign research should be exploited by Norwegian firms through licensing or technical exchange arrangements, and, where a direct investment is permitted, majority shareholdings usually should be retained in Norwegian hands. The

---

[2] Published originally in Norwegian but translation available with State Department Airgram A–65 from U.S. Embassy, Oslo, dated Aug. 18, 1964, enclosure 2, 33 pp., and enclosure 3, 15 pp.

Government, however, continued to waive such reservations in specific instances.

PRODUCTION

Norway's electrochemical, ferroalloy, aluminum, and certain iron and steel product manufacturing, all basic export industries, operated at or near capacity levels during 1964. Sizeable gains were reported in production of primary aluminum, iron ore and steel, refined nickel and copper, magnesium, zinc, and nonmetals, notably cement. Market conditions were considered satisfactory in nearly every category. Government iron and steel operations continued to suffer from financial and production difficulties, but money losses were much less than in previous years. The accumulated nickel stock of one company was sold. Under the Government's 4-year industrial and economic program for 1966–69, the metallurgical sector was slated for heavy investment, particularly in aluminum and ferroalloys. Large investments in electric power facilities were also projected to accompany the expansions. Hydropower capacity increased 940 megawatts in 1964, the largest yearly rise to date. Aluminum production was valued at an estimated $111 million in 1964, compared with about $90 million in 1963. Value of ferroalloys produced during 1964 was about half that of aluminum; iron ore and cement outputs were valued at about $20 million each. Production of ore and concentrate alone was valued at about $52 million, and semimanufactures from such minerals contributed an additional $45 million. Output of the mining industry showed nearly a 7-percent rise in value in 1964.

TABLE 1.—Norway: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Metals:					
Aluminum:					
Primary:					
Unalloyed	167,984	174,909	205,892	[1] 216,100	[1] 247,079
Alloyed	8,448	5,614	[e] 9,400		
Secondary	3,183	3,000	3,400	4,700	9,000
Semimanufactures	17,132	17,697	16,500	[e] 19,000	[e] 20,000
Cadmium ... kilograms	110,000	105,000	115,000	110,000	[r] 115,000
Cobalt	478	555	600	625	568
Columbium concentrate ... kilograms	345,997	321,197	[r] 300,504	355,000	186,000
Copper:					
Metal, content of concentrate	15,391	13,952	15,535	14,264	14,812
Smelter [2]	21,614	21,970	[r] 19,153	[1] 18,197	17,234
Iron and steel:					
Iron ore ... thousand tons	[r] 1,658	1,673	1,950	1,966	2,051
Pig iron ... do	374	378	399	407	438
Ferroalloys ... do	289	313	265	[e] 279	446
Steel ingots and castings ... do	489	499	489	542	615
Semimanufactures ... do	277	303	NA	NA	NA
Lead:					
Metal content of ore	2,522	2,290	3,100	3,500	3,600
Smelter	----	----	----	----	4,000
Secondary	1,600	1,000	1,800	2,000	2,000
Magnesium metal	10,317	14,531	14,900	20,600	22,000
Molybdenum, metal content of concentrate	246	241	261	[r] 242	231
Nickel metal	30,428	32,215	29,202	26,421	30,110
Tin, secondary ... long tons	721	71	76	NA	NA
Titanium concentrate	231,916	307,408	251,100	252,337	271,800
Zinc:					
Metal, content of concentrate	10,337	9,330	11,400	[r] 12,428	11,850
Smelter	43,962	46,527	44,976	[1] 46,556	48,358

See footnotes at end of table.

TABLE 1.—Norway: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Nonmetals:					
Cement......thousand tons..	1,151	1,274	1,412	[1] 1,438	[1] 1,512
Dolomite	160,700	145,000	160,000	205,800	220,000
Feldspar	54,193	70,000	55,000	66,000	66,300
Graphite	5,840	5,700	6,552	7,600	6,400
Lime	123,330	NA	NA	NA	110,000
Limestone......thousand tons..	3,220	3,400	3,500	3,900	4,000
Mica	2,900	3,500	[e] 3,200	3,600	4,000
Nepheline syenite	----------	8,149	19,940	23,000	31,000
Pyrites	832,714	733,391	793,000	[1] 721,446	709,660
Quartz	346,000	370,000	410,000	[e] 400,000	410,000
Sands (olivine and foundry)	40,736	43,200	50,900	56,900	58,000
Sulfur, elemental	72,399	62,138	45,927	----------	----------
Talc and soapstone, ground	64,000	65,000	65,000	[e] 67,000	138,000
Mineral fuels:					
Solid:					
Coal (from Spitzbergen)	403,615	369,053	[r] 472,848	[1] 382,398	442,400
Coke, low-temperature	47,000	45,000	45,000	36,300	44,900
Peat:					
Agricultural use	38,000	45,000	36,000	[r] 40,000	42,000
Fuel	180,000	163,000	146,000	104,000	118,000
Liquid:					
Motor gasoline..thousand 42-gallon barrels..	185	2,100	2,700	2,800	3,600
Kerosine......do....	5	30	200	100	70
Distillate fuel oil......do....	264	4,500	6,800	5,700	6,200
Residual fuel oil......do....	141	4,500	6,200	7,800	9,500
Lubricants......do....	179	40	200	200	300
Others......do....	240	600	700	600	750

[p] Preliminary. [e] Estimate. [r] Revised. NA Not available.

[1] Final figure; supersedes that given in Commodity Chapters Volumes I and II.

[2] Totally recovered from an imported nickel-copper matte.

TRADE

Mineral trade was generally at a higher level than in 1963, when an estimated $425 million in minerals and products was imported, versus $380 million exported. Crude and refined petroleum led these imports, accounting for slightly less than one-third of the value of all minerals, and iron and steel was second with between one-fourth and one-fifth of the value. Mineral exports were dominated by nonferrous metals (largely aluminum and magnesium), contributing nearly one-half of the total value. Iron and steel, including the ferroalloys, and fertilizers were other outstanding export commodities. Both export prices and volume, in most cases, were higher in 1964. Trade with Communist countries increased noticeably. Among items traded with these countries were petroleum products, fertilizers, basic chemicals, and iron and steel products. Norway imported about $5.4 million in Soviet nonferrous metals, mainly aluminum, in 1964. As in previous years, West Germany was the prime European customer for aluminum, magnesium, and ferroalloys. Aluminum, nickel, and ferrochromium represented nearly one-half of the value of all Norwegian exports to the United States. Exports of mineral products to the United Kingdom increased significantly in 1964, but expansion was impeded by the latter's enactment of a temporary 15 percent surcharge on imported goods, which caused considerable stress in Norwegian trade circles. Selected items however, including pig iron and silicon, were later specifically excepted. Norway was concerned lest its principal export items to the European Economic Community, such as aluminum, magnesium, and ferroalloys, be excluded from the general tariff reduction plan during the forthcoming Kennedy Round of the General Agreement on Tariffs and Trade (GATT). The Government supported maximum possible cuts. Tariff quotas on the above products were set for 1965 after meeting with the Common Market Commission at Brussels in September.

TABLE 2.—Norway: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Ingot, including alloys	171,690	207,513	United States 79,818; United Kingdom 50,683; West Germany 33,597; Italy 11,455; Sweden 11,164; Denmark 4,894; Brazil 3,460; Hungary 2,152.
Scrap	430	646	West Germany 315; Italy 187.
Semimanufactures	[r] 4,519	4,237	Denmark 1,534; Sweden 1,183; Finland 562; Rep. of South Africa 268.
Cadmium, unwrought	87	86	NA.
Cobalt, unwrought	645	639	NA.
Columbium-tantalum ore	268	286	NA.
Copper:			
Ore and concentrate	[r] 27,144	10,048	West Germany 7,224; Sweden 2,823
Matte	15,759	1,125	All to West Germany.
Ingot, including alloys:			
Unrefined	[r] 4,228	4,560	All to West Germany.
Refined	[r] 14,947	12,603	West Germany 5,748; France 2.946; Switzerland 889; United Kingdom 867; Sweden 797.
Scrap	1,602	2,054	West Germany 883; Sweden 533; Japan 299; Italy 236.
Semimanufactures	[r] 2,234	2,667	Denmark 958; United States 412; Netherlands 327; Sweden 305.
Iron and steel:			
Iron ore, including roasted pyrites. thousand tons	[r] 1,350	1,295	West Germany 742; United Kingdom 416; Poland 80.
Pig iron do	135	509	United Kingdom 186; West Germany 124; Belgium-Luxembourg 50; Sweden 35; Netherlands 20.
Ferroalloys:			
Ferromanganese	46,580	60,454	Belgium-Luxembourg 16,093; West Germany 14,483; Netherlands 8,954; United Kingdom 7,160.
Ferrosilicon	135,909	154,060	NA.
Ferrosilicomanganese	71,702	84,354	NA.
Ferrochrome	17,067	27,477	NA
Ferrosilicochrome	2,673	4,767	NA.
Others	924	1,930	NA.
Total	274,855	333,042	United Kingdom 100,528; West Germany 76,033; Sweden 21,660; Belgium-Luxembourg 16,225; United States 13,263.
Steel ingots and equivalent primary forms.	[r] 48,677	89,277	Netherlands 57,281; Denmark 11,609; France 7,323.
Semimanufactures	[r] 136,905	198,138	United Kingdom 53,587; Sweden 37,694; West Germany 32,133; United States 18,047.
Lead:			
Ore and concentrate	5,151	3,432	United Kingdom 2,528; West Germany 743.
Ingot, including alloys	255	186	Sweden 144.
Scrap	[r] 2,397	2,735	Denmark 1,580; Sweden 545; United Kingdom 281.
Semimanufactures	[r] 346	419	Sweden 414.
Magnesium:			
Unwrought	14,759	19,013	NA.
Scrap	152	104	West Germany 43.
Manganese ore	203	2,540	United States 2,032; United Kingdom 508.
Molybdenum concentrate	488	424	NA.
Nickel:			
Ingot	27,680	23,937	United States 8,180; West Germany 5,042; Sweden 4,275; United Kingdom 3,626.
Semimanufactures and scrap	860	730	Sweden 250; Italy 131; United Kingdom 107.
Platinum metal troy ounces	15,786	10,610	United States 8,584; Netherlands 2,025.
Silver, all forms do	19,226	15,914	West Germany 4,822.
Tin, all forms including scrap. long tons	[r] 313	272	Sweden 205.

See footnotes at end of table.

TABLE 2.—Norway: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals—Continued			
Titanium concentrate	233,786	240,510	West Germany 196,000; United Kingdom 24,000; Italy 19,000.
Zinc:			
Concentrate	15,201	14,505	West Germany 9,778; Poland 4,726.
Ingot, including alloys	33,519	33,650	Sweden 10,180; West Germany 9,713; United Kingdom 6,141; Denmark 3,432.
Semimanufactures and scrap	[r] 1,393	1,874	United Kingdom 339; West Germany 299; Sweden 275; Netherlands 258.
Nonmetals:			
Cement	212,303	236,022	United States 153,810; Spain 49,160; Central West Africa 19,000; Nigeria 6,238.
Dolomite	59,779	66,140	West Germany 13,443; Sweden 13,016; United Kingdom 8.557; Netherlands 8,409.
Feldspar	71,411	71,701	United Kingdom 35,795; Netherlands 8,640; West Germany 8,062.
Fertilizers (chemical):			
Nitrogenous ---- thousand tons	1,206	1,328	Denmark 651; Sweden 327; Spain 82; Finland 75; United States 59; mainland China 44; Poland 30; Indonesia 21; Greece 11.
Phosphatic	26,371	24,131	Denmark 16,800; Iceland 4,800; France 2,527.
Other	9,863	9,245	Denmark 8,733.
Graphite	6,655	7,108	United States 2,407; West Germany 1,715; United Kingdom 1,831.
Limestone	25,592	19,847	Sweden 18,506.
Mica	3,020	3,583	France 936; West Germany 691; Sweden 532.
Pyrites, unroasted	[r] 549,813	639,469	West Germany 503,927; Sweden 65.155; Denmark 48,131; East Germany 16,849.
Quartz	[r] 34,268	16,196	United Kingdom 6,428; West Germany 5,600 Sweden 1,820.
Salt	3,048	6,027	Denmark 2,575; Iceland 1,975.
Stone, dimension	66,594	72,789	West Germany 17,902; Netherlands 14,156; France 13,400.
Sulfur	32,769	7,404	Sweden 7,290.
Talc	64,176	66,855	United Kingdom 17,159; Denmark 9,462; West Germany 8,761; Sweden 7,881.
Mineral fuels:			
Coal	179,979	175,241	West Germany 170,103; Denmark 5,078.
Coke	4,216	8,818	Netherlands 8,261.
Petroleum products . thousand tons	1,216	1,231	Sweden 645; Denmark 416; United Kingdom 94; West Germany 62,

[r] Revised. NA Not available.

TABLE 3.—Norway: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Bauxite	38,404	24,873	Greece 24, 461.
Alumina	[r] 411,853	444,544	Jamaica 180,087; United States 108,872; Guinea 107,813; British Guiana 39,079.
Ingot, including alloys	1,376	1,481	U.S.S.R. 823; United Kingdom 209; Canada 188; United States 187.
Scrap and semimanufactures	[r] 8,401	10,027	Sweden 2,681; Belgium-Luxembourg 2,455; United Kingdom 2,243.
Antimony	117	91	NA.
Chromite ore	50,747	32,265	Turkey 15,902; Rhodesia-Nyasaland 6,459; Greece 5,159; U.S.S.R. 2,504; India 2,234.
Copper:			
Ingot, refined	[r] 5,580	5,038	United States 2,741; United Kingdom 1,347; Sweden 673.
Alloys and scrap	[r] 145	46	United Kingdom 35.
Semimanufactures	18,835	18,581	Sweden 9,480; Canada 5,862; United Kingdom 867; West Germany 699; Finland 584.
Gold ---- troy ounces	23,148	15,560	NA.

See footnotes at end of table.

TABLE 3.—Norway: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Iron and steel:			
Iron ore	21,503	11,043	Sweden 11,038.
Iron and steel scrap	44,188	33,934	United Kingdom 25,179; Denmark 3,804.
Pig iron	8,486	10,197	Sweden 6,734; West Germany 2,602; Netherlands 495.
Ferroalloys	322	215	United Kingdom 65; Sweden 55.
Steel, ingots and equivalent primary forms.	[r] 14,835	7,949	Sweden 4,549; Denmark 3,264.
Semimanufactures	[r] 634,899	652,816	United Kingdom 126,975; Belgium-Luxembourg 108,574; West Germany 103,713; Netherlands 94,034; France 89,331.
Lead and alloys:			
Ingot	[r] 9,521	11,217	Sweden 3,852; Mexico 1,975; United States 1,626; Peru 1,548; Denmark 1,470.
Scrap	45	208	Sweden 174; Finland 34.
Semimanufactures	[r] 1,356	1,058	Netherlands 252; West Germany 224; Belgium-Luxembourg 211.
Managanese ore	[r] 284,107	233,446	Ghana 99,035; British Guiana 43,152; Rep. of South Africa 31,563; Morocco 9,910; Brazil 9,488; India 8,706.
Mercury 76-pound flasks	841	725	Spain 290; United Kingdom 174; Italy 116; mainland China 87.
Nickel:			
Matte	60,857	56,451	All from Canada.
Scrap	532	168	Netherlands 102; United Kingdom 67.
Semimanufactures	398	337	United Kingdom 182; Sweden 76; West Germany 65.
Platinum, all forms troy ounces	[r] 7,877	3,311	United Kingdom 2,765.
Silver, all forms thousand troy ounces	2,735	2,163	United Kingdom 1,255; West Germany 829.
Tin, all forms long tons	[r] 693	732	United Kingdom 346; mainland China 116; Denmark 101.
Zinc:			
Ore and concentrate	69,465	84,861	Sweden 33,753; Australia 18,994; Canada 13,859; Belgium-Luxembourg 6,434.
Ingot, including alloys	2,301	1,823	U.S.S.R. 1,528; Mexico 126.
Semimanufactures and scrap	[r] 3,365	3,627	France 1,356; Sweden 693; Belgium-Luxembourg 662; Poland 286.
Others [1]	[r] 293	371	Africa 83; U.S.S.R. 56; Italy 39; Sweden 34; mainland China 30.
Nonmetals:			
Asbestos	5,231	3,530	Rhodesia-Nyasaland 1,192; U.S.S.R. 1,030; Canada 651.
Barium compounds	360	626	Algeria 300; West Germany 294.
Cement	7,021	6,756	Denmark 3,463; United Kingdom 1,712.
Chalk	5,593	5,428	France 3,769; Sweden 505.
Clays, refractory	81,923	103,848	United Kingdom 91,546; Czechoslovakia 3,134; United States 2,197.
Cryolite, natural	1,892	3,291	Denmark 3,290.
Diatomaceous earth	5,928	3,851	Denmark 2,140; United States 1,391.
Dolomite	3,754	6,764	United Kingdom 4,223; West Germany 1,272.
Fluorspar	[r] 1,540	1,581	West Germany 711; United Kingdom 646.
Graphite	420	249	United Kingdom 177.
Gypsum (some calcined)	54,575	57,369	Poland 51,680; France 3,606; West Germany 1,791.
Lime	13,776	17,965	Sweden 9,230; Denmark 8,512.
Limestone	106,588	113,635	United Kingdom 99,470; Sweden 9,801; Denmark 4,361.
Magnesite	[r] 6,308	7,337	Netherlands 5,982; Yugoslavia 907.
Mica	4,212	3,443	India 3,411.
Phosphate rock	168,367	149,784	U.S.S.R. 85,853; Morocco 53,360; United States 5,640.
Potassic fertilizers	86,792	102,540	Spain 59,646; France 21,349; West Germany 9,748; U.S.S.R. 7,046.
Quartz	3,754	1,211	Sweden 1,163.
Salt	[r] 246,703	264,085	Netherlands 108,847; West Germany 44,380; Italy 33,330; Tunisia 26,005.
Sands, foundry and glass	79,273	73,799	Belgium-Luxembourg 43,778; Sweden 10,545; Netherlands 6,869.
Sulfur	14,289	35,527	France 24,063; United States 8,195; Poland 3,157.
Talc	2,762	3,679	India 2,221; mainland China 1,020.

See footnotes at end of table.

TABLE 3.—Norway: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Mineral fuels:			
Coal	251,936	224,503	United Kingdom 110,563; Poland 55,613; West Germany 28,196; United States 12,104; Netherlands 11,655.
Coke:			
From coal	674,767	826,970	United Kingdom 625,907; West Germany 89,725; Netherlands 38,915.
From petroleum		115,230	United States 110,351; West Germany 3,995.
Petroleum:			
Crude oil thousand tons	2,355	2,536	Venezuela 1,495; Saudi Arabia 797; Iraq 198; Libya 46.
Refinery products do	2,990	3,269	United Kingdom 1,202; Netherlands 938; U.S.S.R. 265; Venezuela 140; United States 125; Belgium-Luxembourg 108.

[r] Revise. NA Not available.
[1] Including tungsten, molybdenum, tantalum, cadmium, cobalt, antimony, and uranium.

COMMODITY REVIEW

METALS

Aluminum.—Norway's aluminum production reached a new high with a 31,000 ton increase in primary production. The industry continued to be characterized by vigorous expansion favored by low-cost energy. Its seventh aluminum plant neared completion and was due to operate in late 1965. This partly French-financed smelter being built by Sor-Norge Aluminum A/S at Husnes, on Hardanger Fjord, will have an initial annual capacity of 60,000 tons, and was designed for eventual expansion to 180,000 tons, with development of adequate power sources. The Government corporation A/S Årdal og Sunndal Verk, Norway's leading producer, and one of the leading producers of Europe, was completing expansions to raise annual capacity of its Årdal plant at the head of Sogne Fjord to 105,000 tons, and planned two new potlines at Sunndalsøra, on the Sunndals Fjord, to increase capacity there from 55,000 to 104,000 tons by late 1968. Along with these increases, Government-owned hydroelectric plants at Aura were being expanded and a new one was under construction at Trollheimen to provide power for Sunndalsøra. Besides Aura power (200,000 kilowatts installed capacity), the Årdal plant drew from the company-owned Tyin and Fortun-Granfasta hydro plants, having combined capacity of 265,000 kilowatts. The company produced about two-thirds of Norway's aluminum in 1964.

Among other developments, Mosjøen Aluminium A/S, jointly owned by Aluminum Co. of America and Elektrokemisk A/S, planned to boost annual ingot capacity at its northern plant from 47,000 to 80,000 tons by 1967–68, with an additional 25,000 tons later, as power from the Rana Kraftverk hydro plant came on line. It planned also to erect a southern smelter at either Kvinisdal or Lista, using power supplied from the Sira-Kvina hydro plant under construction. A/S Norsk Aluminium Co. completed a second potline at its Høyanger smelter in West Norway, increasing annual capacity from 14,000 to 27,000 tons, and expanded a subsidiary plant, Nordisk Aluminium Co., at Holmestrand, south of Oslo, where aluminum semimanufactures and products were made. A/S Alnor, a subsidiary of Norsk Hydro-Electrisk Kvalstofaktieselskabet (Norsk Hydro) and Harvey Aluminum Co. (United States), began construction at Karmøy, west Norway, of a 60,000-ton-per-year reduction plant to be operating at 1967 with power supplied from the Roldal-Suldal hydro plant. Later expansion to 120,000 tons was anticipated, and rolling, extrusion, wire, and cable facilities were to be established. Det Norske Nitrid A/S produced about 9,000 tons of ingot at Eydehavn and 19,000 tons at Tyssedal. With these accelerated activities and others in the future, Norway's annual aluminum capacity was expected to reach 300,000 tons in 1965 and 500,000 tons by 1970.

Aluminum ingot exports totaled about 265,000 tons, more than one-fourth higher than in 1963; imports of alumina came to 522,786 tons and bauxite 30,034 tons, with trade patterns remaining about the same. A/S Årdal og Sunndal Verk maintained its place as second largest aluminum exporter in the world; it continued supplying ingots to Aluminum Co. of America and Aluminum Co. of Canada Ltd. (40,100 tons in 1963) in exchange for alumina, and, during 1964, it purchased nearly 9,200 tons of Soviet aluminum at 22.5 cents a pound. One company, Norsk Aluminium A/S, imported bauxite and processed it into alumina.

Iron Ore.—A world leader in ferroalloys, Norway had a relatively small steel industry, and continued to produce a surplus of iron ore for foreign markets. Taconite similar to that in the Lake Superior region of Minnesota was mined by Government-owned A/S Sydvaranger, the country's prime iron ore producer near Kirkenes in northern Norway.[3] This open pit deposit, close to the Soviet border, has been mined since 1910. Ore averaging about 32 percent iron is magnetically concentrated to a product containing 65 to 66 percent iron and 5 to 10 percent moisture. Its 1964 ore production totaled 3.4 million tons; of 1.66 million tons of concentrate shipped, 690,000 tons went to West Germany, 530,000 tons to the United Kingdom, and about 400,000 tons to Norwegian ports.

Norway's total iron ore concentrate exports (excluding pyrites) for the year reached 1.55 million tons compared with 1.23 million tons in 1963. Most other production came from small mines with limited capacities, but in late 1964 a large new development, the Rana open pit mine of A/S Rana Gruber, located in Dunderland Valley, came into operation, sharply boosting production and export rates. The Rana mine, about 15 miles from the Government's A/S Norsk Jernverk (Norwegian Iron and Steel Works) at Mo-i-Rana, was expected to supply that plant with ore, releasing for export some 300,000 to 400,000 tons of ore supplied annually from Sydvaranger. Initial capacity was rated at 750,000 tons annually with plans to double; reserves were estimated at 400 to 600 million tons of high-grade, low-phosphorus (.015 to .05 percent) ore.

A/S Sydvaranger diamond drilled mine concessions in the Sør-Varanger district, conducted geophysical surveys in Finnmark, and was expanding its concentrator to 2.4 million tons of product annually, a 50-percent increase over current capacity. A large order of new equipment was due from the United States, including fifteen 65-cubic-yard dump trucks, four 7½-inch "down-the-hole" rock drills, and four 9-cubic-yard electric power shovels, supplementing older U.S. Marshall Plan-supplied equipment. As a result of expansions, Norway's annual iron concentrate production in 1964 is expected to rise by 250,000 tons or more. State-owned Fosdalen Bergverk A/S, as Trondheimsfjord, continued sinking a main shaft and was developing the eastern part of its orebody where diamond drilling has indicated 15 million tons of 40 percent iron ore. Production was scheduled to start in 1969–70 from this section. During 1964 the company produced 267,000 tons of magnetite concentrate and 14,500 tons of pyrite. Fosdalen continued as the principal source of supply for privately-held Christiania Spigerverket (Christiana Steel Works, Oslo) and supplied part of Mo-i-Rana's needs.

---

[3] U.S. Embassy, Oslo. State Department Airgram A–738, June 12, 1965, 4 pp.

Capacity of ore handling facilities are Narvik, Norway, the principal export point for Swedish iron ores which come by rail from the Kiruna and Malmberget areas, were being expanded from 16 million to more than 18 million tons annually.[4] This ice-free west coast port, the leading Scandinavian port tonnagewise, exists largely because of operations by the Swedish state iron mining concern, Luossavaara-Kirunavaara A/B. The company was experimenting with 62- to 72-ton rail cars to replace 42-ton cars currently in use.

Ferroalloys.—Manufacture of ferroalloys reached a record 446,000 tons in 1964, with increases in all categories; the most important increase was ferrosilicon, which constituted 213,000 tons of the output, or about one-half of Europe's entire production. Nine ferrosilicon producers were in operation and were to be joined in 1967 by a tenth with the establishment by Electrokemisk A/S of its Salten Verk smelter at Fauske in northern Norway; four producers of ferrochromium and ferromanganese alloys maintained operations, dominated by Union Carbide Corp. subsidiary, Electric Furnace Products, Ltd. Exports in 1964 totaled 443,493 tons, divided as follows: Ferrosilicon 218,838 tons, ferrosilicomanganese, 107,700 tons; ferromanganese, 73,335 tons; ferrochromium, 34,212 tons; ferrosilicochrome, 8,236 tons; and others, 2,172 tons. Main markets continued to be the United Kingdom, West Germany, Sweden, and Belgium-Luxembourg. Foreign raw materials needed for ferroalloys included 360,000 tons of manganese ores, up more than 50 percent from 1963, and 109,388 tons of chromite, more than three times the amount imported in 1963.

Iron and Steel.—Crude steel output rose 13 percent in 1964, mainly as a result of expansions at the state-owned complex, A/S Norsk Jernverk, at Mo-i-Rana, north central Norway, where over half of the country's steel was made. Imports of steel semimanufactures were more than three times as large as exports, both imports and exports running 22 percent ahead of those in 1963. Mo-i-Rana continued to operate at a loss, but the net deficit was estimated at only $360,000 compared with about $4 million in 1963. Production included 355,000 tons of pig iron, 240,000 tons of L-D (Linz-Donawitz) steel, and 195,000 tons of electric steel, and company sales totaled 418,000 tons of products valued at $39 million. About three-fourths of production was exported, $11 million worth of pig iron and rolled products going to the United Kingdom. The remainder was manufactured into a wide variety of rolled and semifinished products; a sheet rolling plant was operated at Bergen.

---

[4] U.S. Embassy, Oslo. State Department Airgram A–731, June 10, 1965, 3 pp.

In early 1964, the Government established a committee to recommend on reorganization of A/S Norsk Jernverk to stem its financial losses. Specifically, the committee was requested to evaluate possibilities of cooperative agreements with foreign or domestic companies, combination of steel mill operations with the nearby coking works of Norsk Koksverk A/S, sale of the latter's ammonia plant, and transfer of the steel mill's head office from Oslo to Mo-i-Rana. Unconfirmed reports indicated that Swiss interests might take over the operation. The committee's report was still pending at yearend.

Christiania Spigerverk, the country's second largest steel producer and a private concern, produced a wide range of finished products almost entirely for domestic consumption, employing nearly as many people as the Government's Mo-i-Rana complex. Stavanger Electro-Staalverk A/S continued a small production of specialty steels.

Magnesium.—Norway was one of the world's leading producers of magnesium, and increased output about 1,400 tons in 1964 over that in 1963. Expansion from its current capacity of 25,000 tons was planned. Norsk Hydro-Electrisk Kvalstofaktieselskabet operated the lone plant, southwest of Oslo, using domestic electricity and dolomite, seawater, and West Spitsbergen coal. Exports amounting to 23,113 tons in 1964 went chiefly to the Federal Republic of Germany where much of it was used in Volkswagen automobile manufacture.

Titanium.—Output of titania concentrate, all from one producer, A/S Titania, was 8 percent higher than in 1963, but was still below the 1961 peak. The producing company, a National Lead Co. subsidiary, with operations at Soknedal in southwest Norway, was mining one of Europe's largest ilmenite-magnetite deposits and in 1964 produced 850,000 tons of ore, recovering 270,00 tons of ilmenite concentrate that averaged about 45 percent TiO_2 plus 83,000 tons of magnetite. Ore reserves at the company's new Tellnes mine have been estimated at 350 million tons, and operations were based on mining 300,000 tons anually by open pit methods. The ilmenite ores contained about 18 percent TiO_2, and a fair amount of magnetite. Resulting ilmenite concentrate is largely exported and sold for titanium paint pigments. Titan Co. A/S, another National Lead subsidiary, started production at its Fredrikstad titanium dioxide plant rated at 15,000 tons per year. The bulk of the new plant's output is expected to go to nearby Scandinavian countries.

Nickel, Copper, Cobalt.—Falconbridge Nikkilverk A/S, processing imported copper-nickel matte from Canada (50,811 tons in 1964), accounted for most of Norway's copper and all of its nickel output. The operation took all the smelter output of its parent Canadian company Falconbridge Mines, Ltd. Imported matte assayed about 28 percent copper, 48 to 50 percent nickel, and contained small amounts of cobalt, selenium, and precious metals. Blister copper also was produced from domestic ores at the country's largest base-metal mining operation, Sulitjelma Gruber A/S, which, in addition, recovered zinc and pyrite concentrates, shipped elsewhere. The company's electric smelter and air-blown converter capacity was placed at about 5,000 tons of copper per year. Falconbridge, with capacity of about 18,000 tons of copper, 34,000 tons of nickel, 700 tons of electrolytic cobalt, and recovery of 22,000 tons of sulfur dioxide, produced about 12,500 tons of copper and over 30,000 tons of nickel in 1964, plus minor quantities of silver, selenium, and platinum. Nearly the entire copper and nickel output was exported. Drawing partly from stocks, a total of 33,865 tons of nickel ingot was exported in 1964, a significant gain over the 23,937 tons in 1963; shipments went mainly to the United States, West Germany, and Sweden. Besides matte copper, 5,010 tons of copper ingot and nearly 20,000 tons of copper semimanufactures were imported for Norwegian metal-working industry. Copper concentrate amounting to 14,300 tons was exported in 1964.

In domestic copper mining, about 12 relatively small underground mines were active. The old producer A/S Røros Kobberverk treated ore from one small mine (averaging 1.18 percent copper) and old waste dumps (0.53 percent copper), output totaling 2,829 tons of concentrates, all exported. Killingdal A/S mined a thin orebody at a depth of about 4,000 feet producing 2,400 tons of copper concentrate, 2,600 tons of zinc concentrate, and 33,000 tons of pyrite, 17,000 by flotation and the rest simply crushed. The Bjørkaasen mine's mainly pyrite orebody was exhausted at a depth of about 2,300 feet and the 50-year-old mine was closed. The small Gradval mine on the west coast was also closed. Copper deposits at Bidjovagge, Finnmark, and copper-containing pyrite deposits in the Grong district were still being studied at yearend. Operations at the state-owned Joma copper-zinc-pyrite mines near Steinkjer were scheduled to start in 1966. The Norwegian Polar Institute found indications of copper, lead, and zinc mineralization in contact zones of granitic rocks and planned to do extensive mapping and explorations during 1965 in the northeast sector of Svalbard (Nord-Austlandet).

Lead and Zinc.—Two mines produced lead concentrate together with pyrite and other base metals, most of the output coming from the mine of Bleikvassli Gruber A/S. The latter company and Folldal Verk A/S also produced over three-fifths of the domestic mine output of zinc, the rest being divided among five other operators. The lead concentrate was exported in the absence of any domestic primary refining. Needs for lead and lead products were met by imports, except for small tonnages of domestic secondary lead; lead ingot imports totaled 9,860 tons, 12 percent less than in 1963, Sweden continuing as the principal supplier. The entire zinc production continued to be processed at one of Europe's largest electrolytic zinc plants, operated by Det Norske Zinkkompani A/S at Eitrheim. In 1964, 78,728 tons of imported zinc ores also were refined. Zinc metal exports of 39,972 tons, nearly four-fifths of the refined production, went largely to Sweden and other West European countries. A Swedish firm, Bolidens Gruvaktiebolag, was reported to have obtained a half interest in Det Norske Zinkkompani A/S through an exchange of shares with Belgian owners Royale Asturienne des Mines, and plans were underway for expanding capacity to 64,000 tons of zinc per year.

Other Metals.—The Board of Directors of Norsk Bergverk A/S discussed suspension of operations at the columbite mines at Søve in Telemark County; production at the Government-owned mines was the lowest since 1950. Cadmium metal continued to be a byproduct from zinc refining by Det Norske Zinkkompani A/S, and most was exported. Cobalt was a byproduct of processing imported nickel-copper matte, with the United States continuing to receive a major share of the output. Molybdenum concentrate produced by A/S Knaben Molybdaengruber in southern Norway was exported to Sweden; 225,000 tons of ore was mined in 1964 to obtain 381 tons of concentrate. Norway produced no precious metal ores, but some recoveries were made of platinum and silver from imported Canadian nickel-copper matte. Platinum exports, in crude form, were thought to reflect the quantity produced. Imported precious metals went into Norway's sizable metal-working industry. Tin production was derived from processing scrap, chiefly tinplate, at the A/S Stavanger Tinfabrik in southern Norway. Most of the scrap was domestic, and tin was consumed by Norway's large canning industry besides being exported largely as solder to Sweden.

NONMETALS

Cement.—Production increased 5 percent in 1964, while exports rose to 333,000 metric tons, a large share going as in the past to the United States. Producers and outputs, in thousand tons, were Dalen Portland Cementfabrik, 742; Christiania Portland Cementfabrik, 546; and Nordland Portland Cementfabrik, 229. Dalen, credited with most of the exports to the United States, planned expansion to 1.2 million tons by early 1966, and placed an order for a 23-foot diameter Aerofall mill for installation at its Brevik plant during 1965.

Fertilizer and Chemical Materials.—Despite Norway's lack of fertilizer materials such as phosphate rock and potash, considerable quantities of fertilizers, primarily nitrogenous types, continued to be produced as a result of low cost electric power. Nitrogen was obtained mainly by fixation, and sulfur largely from domestic pyrites and smelter gases. Calcium nitrate was a major product (1,246,000 metric tons in the 1962–63 season), followed by complex fertilizers and urea. During 1964 exports of nitrogenous fertilizers rose to nearly 1.4 million tons. Domestic markets consumed an estimated 50,000 tons of equivalent nitrogen in products during 1964, or about 15 percent of total production. Denmark and Sweden remained the chief markets for Norwegian fertilizers; nearly half of urea exports went to Asia, including some to mainland China. Phosphate rock imports, mainly from the U.S.S.R. and Morocco, rose nearly one-third to 195,755 tons in 1964. Nitrogenous production was almost exclusively by Norsk Hydro-Elektrisk Kvalstofaktieselskabet its 4 plants operating at near-capacity—about 325,000 tons of nitrogen equivalent and 450,000 tons of complex fertilizers in 1964. Norsk-Hydro's plants are in Telemark and Nordland Counties. The urea capacity of the main plant at Herøya, south Telemark, was to be increased from 150,000 to 250,000 tons annually, with upcoming operation in 1965 of a 100,000-ton ammonia plant, utilizing gas from fuel oil. This marked a retreat from the more conventional electric-based nitrogen fixation process. In July Norsk Koksverk completed an ammonia plant utilizing coke-oven gasses at iron and steel center Mo-i-Rana; its entire output was to be delivered to Norsk Hydro under a 60,000-ton-per-year contract. Det Norske Zinkkompani A/S produced superphosphate fertilizers using sulfuric acid from zinc smelter gases at Eitrheim, in western Norway.

Sulfur in Norway came chiefly from pyrite recovered in beneficiating nonferrous and iron ores. Smelter gases provide an additional 25,000 to 30,000 tons annually in the form of sulfuric acid. Only about one-tenth of the pyrite output was used domestically in 1964 and the rest exported, chiefly to West Germany. Sintered pyrite, sulfur removed, was included in iron ore exports. During 1964, pyrite production and exports declined alike, the exports to 628,000 tons. Sulfur imports, in contrast, rose to nearly 47,000 tons, almost a third higher than in 1963. About 12 underground mines produced pyrite; among these, Orkla Gruber A/S dominated with about 230,000 tons, or one-third of the output. Orkla abandoned making sulfur from pyrite at Thambshavn South Trøndelag, at the beginning of 1963, due to excessive costs. Elektrokemisk A/S produced 166,000 tons from its Skorovass mine. Two mines were closed down, the 50-year-old Bjørkaasen mine near Narvik and the small Gradval mine on the west coast. Pulp and paper manufacturer Borregaard A/S contracted Dorr-Oliver, Inc., to install a pyrite flotation plant at its new Hjerkim mine and planned to start production by yearend to provide the pyrite equivalent of 200,000 tons of sulfuric acid annually. Phosphate fertilizer producers have been a major acid-consuming group, and increasing quantities of acid have been consumed by zinc, aluminum sulfate and the developing titania producing industries. Carbon disulfide was an important consumer of imported sulfur.

Other Nonmetals.—About 4 million tons of limestone was mined, and used in cement, lime, fertilizer, and calcium carbide manufacture. Dolomite was produced in greater quantity in 1964, about half of it consumed in making magnesium metal. All dolomite came from Hammerfall Dolomitbrudd, subsidiary of Norwegian Talc Co. A/S, a leading nonmetal producer. State-owned Olivin A/S mined high-purity olivine by opencut on the west coast, from one of the largest deposits of its type, and produced olivine foundry sand at the rate of nearly 60,000 tons annually. Among other Norwegian nonmetals were feldspar and nepheline syenite for glass and porcelain; talc mostly processed at Bergen by Norwegian Talc Co. A/S; and quartz, largely consumed by the country's extensive ferroalloy industry. Part of the quartz was sufficiently high purity for ceramic and silicon carbide industries, and some was electronic grade. Silicon carbide made some important gains as Norway's second plant, built by Orkla Exolon A/S and Co., came into operation at Orkdal, south Trøndelag Co. at the beginning of the year. Owned by Exolon Co., of Tonawanda, New York, and two Norwegian firms, the plant has initial capacity of 4,000 to 5,000 tons of silicon carbide, bringing Norway's total capacity to about 30,000 tons annually. A third plant of 8,000 tons initial capacity, was under construction at Lillesand, Aust Agder County, and Norton Norge A/S, a subsidiary of Norton Co. of Massachusetts, was due in operation by mid-1965. Raw material requirements will include 12,000 tons each of petroleum coke and quartz annually; a concession was arranged with the Storting for leasing 13,000 kilowatts of low-cost electric power.

MINERAL FUELS

Coal and Coke.—Norway's only coal producer in 1964 was Store Norske Spitsbergen Kulkompani, with operations at Svalbard on West Spitsbergen Island. Shipments, which are seasonal, were up about one-tenth, large tonnages going to the new state-owned Norsk Koksverk A/S coking plant at Mo-i-Rana, placed in operation about midyear. Norsk Koksverk was originally planned to provide an outlet for coal from the state-owned Kings Bay mines (Spitsbergen) but, since these mines were abandoned after explosions in 1962, the bulk of annual 350,000-ton requirements has come from the lone privately owned source. Capacities at Norsk Koksverk were 250,000 tons of coke and 20,000 tons of coal tar; ammonia also was produced. A/S Norsk Jernverk (steelworks) was to receive half of the coke output, and other Norwegian plants the rest.

With the new plant operating, coke imports fell to 767,000 tons and coal exports dropped to 83,971 tons, while coal imports rose to 276,000 tons. About one-fifth of imported coal was anthracite. Coke continued to come largely from the United Kingdom and West Germany and coal from the United Kingdom and Poland. West Germany received most of the exported Spitsbergen coal.

Petroleum.—Lacking petroleum resources, Norway continued imports of crude for its small refining industry, and of refined products in increasing quantities. Crude imports in 1964 rose to about 2.7 million tons, and were largely from Venezuela and Saudi Arabia; refined products totaled 3.53 million tons, mainly from the United Kingdom and the Netherlands. More petroleum products were exported in 1964, the 1.32 million tons total going chiefly to Sweden and Denmark. Net consumption, including ship and plane bunkers, was placed at about 4.6 million tons, gaining about 7 percent over 1963. Bunker products for vessels in 1964 totaled 923,300 tons, about half for foreign and half for domestic ships. Gasoline for cars and planes at yearend retailed at 56 cents to 64 cents per gallon depending on garde, including taxes of from 36.1 cents on regular to 36.6 cents (less 29 cents refundable) on aviation gasoline.

Norske Esso A/S completed a 600-barrel-per-day lubricating oil refinery at Valløy, on Oslofjord, about 6 miles from the large Esso refinery at Slagen. The new unit utilized hydrogen gas piped from the main plant. Standard Oil Co. (New Jersey) through subsidiaries also operated Norway's two other refineries, the largest at Slagen rated at 40,000 barrels a day and processing over nine-tenths of all crudes refined. Shell Oil Co. was trying to secure terms as favorable as those under which Esso built its Slagen plant for a 40,000-barrel refinery at Risavika, near Stavanger, set for completion tentatively in 1967–68. Shell's refinery was expected to cost $40 million, with up to 20 percent of the investment from Norwegian capital

About 10 groups applied successfully for offshore oil exploration permits in 1964. Norsk Caltex Oil A/S completed tentative agreements providing 10 percent royalties to the Government on gross value of possible oil extracted by Caltex from its claims on Svalbard (Spitsbergen), and drilling was expected to start at van Mijenfjord about mid-1965. The company held exploration rights to over 200 claims on Edgeøya and Barentsøya. A consortium of nine of Norway's major industrial and shipping firms and Standard Oil Co. of Indiana, through its subsidiary, American International Oil Co. (Amoco) planned explorations on the North Sea continental shelf in 1966 as a follow-up to geophysical surveys by a Canadian consultant firm. Three Norwegian companies were considering a joint venture to build oil drilling rigs for offshore use in light of the current activities. Norwegian Polar Co. of Trondheim planned to prospect for oil on Svalbard in 1965, and to continue drilling operations on the Brøgger Peninsula and along Grønfjord.

The Mineral Industry of Poland

By Bernadette Michalski[1] [2]

◆

POLAND'S two principal mineral products continued to be high-rank coal and zinc; the country has regularly accounted for nearly 5 percent of the total world output of these commodities in recent years. Other significant mineral products included sulfur, cement, salt, and cadmium. Expanding aluminum, iron and steel, and petroleum-refining industries were based on imported raw materials, obtained principally from the U.S.S.R.

Total industrial output for 1964 was 9 percent higher than in 1963, reversing the 1962–63 decline in the industrial growth rate. The problem of overemployment which has resulted in excessive gross wage payments was minimized by a cut in employment growth rate increase to 1.9 percent from 3.4 percent in 1963. The growth rate of gross wage funds was 4.6 percent as compared to 8 percent in 1963.

Leading mineral-industry developments included the opening of the Plock petroleum refinery, the commissioning of two 100-ton residual oil-fueled Martin furnaces at the Zawiercie Metallurgical plant, and the commissioning of the Warta cement plant at Dzialoszyn. Mineral enterprises in various stages of construction included the Konin Aluminum plant, the Glogow-Legnica copper basin complex, the Miasteczko integrated lead-zinc refinery, the oxygen converter steel mill at the Lenin Plant in Nowa Huta, the Rudnik cement plant, a second nitrogen fertilizer plant at Pulawy, the Bukowa lime plant, and a second sulfur mine at Machow. The Polish press frequently reported construction delays due to inadequate skilled labor and slow delivery of equipment and supplies. Many industrial project completion dates were revised to compensate for time losses.

PRODUCTION

With the exception of significant reported increases in output of electrolytic copper, sulfur and mineral fuels, production increased only moderately over the levels of 1963 and often fell short of announced goals. Petroleum product output in 1964 exceeded that of 1963 by 34 percent, although it was 18 percent below the planned target, apparently because of the delay in opening the Plock refinery. Other mineral products for which production in 1964 exceeded that of 1963 output, but for which output fell short of goals, were (with shortfall expressed in percent): elemental sulfur (4.4 percent below goal), zinc (2.7 percent), aluminum (0.5 percent), mineral fertilizers (1.5 percent), and lime (0.4 percent).

---

[1] Commodity research assistant, Division of International Activities.

[2] Throughout this chapter, the official currency unit of Poland, the zloty (Zl), has been used rather than the U.S. dollar because actual exchange rates differ considerably from the official Zl 1=US$0.25. In most cases, the zloty is overvalued.

Polish feldspar production was reported for the first time at 26,700 metric tons in 1963, compared with an estimated domestic requirement of 56,500 tons by 1970.[3]

TABLE 1.—Poland: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity[1]	1960	1961	1962	1963	1964
Metals:					
Aluminum	26,000	47,600	48,100	[r] 46,600	47,800
Cadmium[e]	390	400	400	420	420
Copper:					
Ore .... thousand metric tons	1,760	1,944	2,162	2,162	2,247
Electrolytic	21,700	22,200	24,100	29,633	36,600
Iron and steel:					
Iron ore .... thousand metric tons	2,182	2,386	2,436	2,609	2,680
Pig iron .... do	4,563	4,770	5.311	5,395	5,643
Steel ingots .... do	[r] 6,681	7,234	7,684	8,004	8,572
Rolled products, excluding pipe .... do	4,422	4,824	5,238	5,457	5,708
Pipe .... do	366	404	450	474	[e] 500
Lead:					
Lead-zinc ore .... do	2,461	2,365	2,497	2,556	2,597
Refined	39,700	39,800	40,680	38,914	41,500
Zinc:					
Refined	175,500	182,000	180,900	181,200	186,900
Including electrolytic	73,800	78,900	82,100	83,500	NA
Nonmetals:					
Barite (92 percent $BaSO_4$)	[e] 11,200	37,341	45,215	45,700	[e] 45,700
Cement .... thousand metric tons	6,592	7,364	7,544	7,670	8,761
Fertilizers:					
Nitrogenous .... do	1,113	1,191	1,269	1,330	NA
Phosphatic .... do	1,045	1,191	1,368	1,389	NA
Feldspar	NA	NA	NA	26,700	[e] 26,700
Gypsum, calcined	104,000	95,800	116,000	117,000	NA
Lime, construction and industrial .... thousand tons	2,166	2,181	2,384	2,433	2,680
Phosphate rock	41,000	46,675	55,904	64,800	[e] 64,800
Salt:					
Rock .... thousand tons	521	608	609	645	660
Other .... do	1,425	1,443	1,466	1,486	1,581
Sulfur:					
Ore .... do	147	1,150	1,740	1,791	NA
Elemental	[r] 26,200	133,000	[r] 210,000	235,200	294,600
Mineral fuels:					
Coal:					
Bituminous .... thousand tons	104,438	106,606	109,604	113,200	117,400
Brown .... do	9,327	10,338	11,091	15,300	20,300
Briquets .... do	1,031	1,013	999	996	NA
Coke .... do	11,900	12,600	13,100	13,900	14,200
Natural gas .... million cubic feet	[r] 20,250	29,956	29,531	[r] 36,690	45,953
Petroleum:					
Crude .... thousand tons	194	203	202	213	282
Refinery products:					
Gasoline .... do	121	139	248	305	385
Kerosene .... do	101	81	28	21	NA
Unspecified .... do	654	710	1,016	1,116	NA
Total .... do	876	930	1,292	1,442	1,933

[e] Estimate. [r] Revised. NA Not available.

[1] In addition to reported commodities, Poland is a known producer of the following (figures indicate order of magnitude of 1964 production in metric tons): Nickle (content of ore) 1,300; silver (troy ounces) 130,000; magnesite 38,000.

---

[3] Przeglad Geologiczny (Geologic Review), (Warsaw, Poland). No. 7, July 1964, pp. 238–260.

TRADE

In terms of value, mineral industry raw materials and products in 1963 accounted for nearly a quarter of all exports, or Zl1.8 billion, and a quarter of all imports, or Zl1.78 billion. While 65 percent of Polish mineral exports was destined for Soviet Ekonomicheskoy Vzayimopomshchi (SEV) countries[4] and 80 percent of mineral imports was of SEV origin, Polish mineral trade with the free world in recent years has been significant when compared with that of other SEV nations. This may be attributed in part to lack of demand for many of Poland's current mineral export commodities in the SEV countries and to the marketability of these materials in Western Europe. Increasing trade activity outside of the SEV group has resulted in a government application for associate member status in the General Agreement on Tariffs and Trade.

TABLE 2.—Poland: Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum	4,810	----------	
Cadmium	350	290	U.S.S.R. 200; West Germany 30; Netherlands 24.
Iron and steel:			
Iron ore	26,300	2,900	United Kingdom 2,200.
Semimanufactures	650,623	597,683	Czechoslovakia 197,000; U.S.S.R. 110,000.
Steel ingots	183,500	161,400	U.S.S.R. 31,000; Syrian Arab Republic 18,000; Hungary 16,000; West Germany 11,000.
Lead concentrate	9,228	5,908	Netherlands 1,963; France 1,820; West Germany 1,529.
Zinc:			
Metal	[r] 67,629	75,520	U.S.S.R. 27,296; Czechoslovakia 16,281; Hungary 7,425; West Germany 5,251; Sweden 5,202; United Kingdom 3,553.
Rolled products	12,367	13,240	U.S.S.R. 4,040; East Germany 2,577; Denmark 2,162; Thailand 932; Turkey 890; Hungary 700.
Nonmetals:			
Cement .... thousand tons	1,260	1,176	Spain 263; U.S.S.R. 164; United Kingdom 117; Nigeria 115.
Lime, burned	50,598	48,230	Czechoslovakia 29,800; Netherlands 14,398.
Limestone	8,476	7,241	All to West Germany.
Refractory clays	89,800	77,800	Italy 41,500; Yugoslavia 13,400; Hungary 11,000; West Germany 7,800.
Salt, rock	----------	106,600	Sweden 33,100; Hungary 21,700; Czechoslovakia 18,900.
Sulfur, elemental	103,200	124,300	Czechoslovakia 55,200; Sweden 18,200; Austria 17,600.
Mineral fuels:			
Coal:			
Bituminous .... thousand tons	17,306	16,892	U.S.S.R. 4,844; Denmark 2,248; East Germany 1,512; Finland 1,454.
Brown, including briquets thousand tons	5,660	5,736	All to East Germany.
Coke .... do	2,145	2,352	East Germany 852; U.S.S.R. 654; Hungary 254; Egypt 247.
Petroleum: Refinery products:			
Gasoline	3,400	3,200	Belgium 900; France 800.
Kerosine	5,200	14,500	Sweden 8,900; West Germany 5,600.
Fuel oil	555,100	554,600	West Germany 173,000; Sweden 146,000; Austria 109,000.
Lubricants	3,300	3,500	Yugoslavia 3,400.
Asphalt	800	10,100	West Germany 5,200; Yugoslavia 4,700.
Paraffin	5,100	3,000	Denmark 700; Sweden 600; Yugoslavia 500; Austria 300.

[r] Revised.

---

[4] Council of Mutual Aid set up under an intercountry agreement that includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Rumania, and the U.S.S.R.

TABLE 3.—Poland: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Alumina	109,000	88,900	Hungary 58,600; France 12,500; United Kingdom 10,400.
Aluminum	6,400	----------	
Bauxite	43,100	60,100	Hungary 60,000.
Antimony, metallic	1,051	----------	
Bismuth	69	72	United Kingdom 62; Japan 9.
Cadmium	2	15	Bulgaria 13.
Chromite	98,000	85,300	Albania 44,200; U.S.S.R. 41,100.
Copper:			
Concentrate	7,500	12,332	Chile 6,386; Morocco 4,011; Cuba 1,935.
Metal including wire	36,538	35,147	United Kingdom 9,649; U.S.S.R. 7,913; Netherlands 4,216; Spain 3,904.
Iron and steel:			
Iron ore thousand tons	8,104	8,806	U.S.S.R. 7,090; Sweden 540.
Rolled products do	150	133	Czechoslovakia 121; Rumania 11.
Steel do	117	95	Czechoslovakia 70; Hungary 22.
Lead:			
Concentrate	----------	50	NA.
Metal	15,813	13,566	Bulgaria 5,504; Yugoslavia 3,550; Sweden 2,760.
Magnesium	385	430	Norway 285; Italy 145.
Manganese:			
Ore	299,200	304,300	U.S.S.R. 246,200; Cuba 27,200; India 22,000.
Peroxide	3,800	3,900	U.S.S.R. 2,200; Cuba 495.
Mercury 76-pound flasks	5,017	4,496	Italy 1,392; U.S.S.R. 1,305; mainland China 928; Yugoslavia 870.
Molybdenum concentrate	357	243	Mainland China 238.
Pyrite concentrate	42,700	24,300	Yugoslavia 23,800.
Tin long tons	2,167	2,429	United Kingdom 1,705; West Germany 445; China 198.
Titanium: Ilmenite	1,383	1,200	All from Finland.
Tungsten concentrate	3,400	2,402	All from mainland China.
Zinc:			
Concentrate	124,000	148,500	United States 34,300; Netherlands 29,600; Bulgaria 13,900; United Kingdom 13,000; Yugoslavia 11,700.
Metal	2,400	2,800	Bulgaria 1,800; North Korea 1,000.
Nonmetals:			
Asbestos	23,924	21,366	U.S.S.R. 13,822; Yugoslavia 2,183; United Kingdom 1,466; mainland China 1,077.
Barite	13,971	8,901	Mainland China 4,990; Yugoslavia 3,762.
Bentonite	7,178	8,478	Yugoslavia 7,328; Hungary 1,116.
Cement	----------	177,600	Czechoslovakia 176,400.
Cryolite	674	1,086	All from U.S.S.R.
Diatomaceous earth	1,199	304	Belgium 210.
Fertilizers, mineral:			
Apatite concentrate	356,600	317,200	U.S.S.R. 308,700.
Nitrogenous	----------	50,100	Norway 30,000; U.S.S.R. 10,400; East Germany 9,700.
Fluorspar	25,900	22,400	Mainland China 11,200; East Germany 11,200.
Graphite	9,674	9,938	Czechoslovakia 8,162; U.S.S.R. 630.
Kaolin	81,300	81,000	Czechoslovakia 50,300; East Germany 18,500.
Magnesite	92,000	125,700	North Korea 50,100; Czechoslovakia 33,100; Yugoslavia 26,500.
Mica	673	613	India 313; Rumania 249.
Refractory clays	3,800	9,700	U.S.S.R. 7,000; West Germany 1,400.
Sulfur, elemental	20,300	27,100	Mainland China 22,000; Hungary 4,700.
Talc, powder	22,700	8,778	North Korea 6,000; mainland China 1,242.

TABLE 3.—Poland: Imports of selected metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Mineral fuels:			
Coal:			
Anthracite......thousand tons..	20	19	All from U.S.S.R.
Anthracite briquets......do....	26	32	All from Czechoslovakia.
Bituminous..............do....	1, 042	1, 233	U.S.S.R. 910; East Germany 302.
Brown coal including briquets thousand tons..	510	520	All from East Germany.
Coke......................do....	103	175	All from Czechoslovakia.
Natural gas......million cubic feet..	10, 184	11, 417	All from U.S.S.R.
Petroleum:			
Crude..........thousand tons..	1, 102	1, 415	Do.
Refinery products:			
Gasoline....thousand tons..	1, 067	1, 108	U.S.S.R. 886; Rumania 112.
Kerosine...............do....	58	53	Rumania 40.
Fuel oil.................do....	1, 289	1, 478	U.S.S.R. 1,317.
Lubricants.............do....	75	82	Rumania 57; U.S.S.R. 16.
Asphalt.................do....	69	70	Albania 37; Hungary 24.
Paraffin.................do....	17	17	U.S.S.R. 11; East Germany 6.
Others..................do....	27	26	U.S.S.R. 14; Rumania 12.

COMMODITY REVIEW

METALS

Aluminum.—A second aluminum plant continued under construction at Konin throughout 1964, failing to be completed as originally planned within the year. Completion of the first stage was rescheduled for July 1966, at which time annual capacity will be 50,000 tons of aluminum. The total projected capacity of 100,000 tons of aluminum was to be achieved by 1970.

The sole operating aluminum plant, the Skawina works, produced at near capacity. A decision to expand the plant by the addition of 60 new electrolytic pots was announced at yearend. This addition would increase capacity by 10,000 tons, bringing total capacity to 60,000 tons in 1968–70.

The aluminum industry remained completely dependent upon imported raw materials. However, research on extraction of alumina from coal ash and domestic clays continued.

Copper.—Construction continued at the principal copper complex in the Legnica-Glogow area. The development of the Legnica-Glogow basin reportedly will provide an exportable surplus of copper. Undoubtedly the export will be directed toward the SEV nations.

The development program reportedly included more than 10 kilometers of shafts, of which more than 1.5 kilometers was sunk in 1964 at the Lubin and the Polkowice I mines. Although shaft-sinking operations were not completed by yearend, horizontal development work was started in July at Lubin. When completed, there reportedly will be a total of 11 new shafts in the mining area, including 5 at the Lubin mine. Construction had been delayed because of water influx, but exploitation was scheduled to begin by 1967 and the mine should be completed about 1970. Construction work was started on the Polkowice refinery with completion scheduled for 1970.

Iron and Steel.—A new iron ore mine was opened in the Klobuch-Czestochowa basin with an annual capacity of 250,000 tons. Domestic ore production, however, satisfied only a fifth of Poland's steel industry requirement. Dependence upon iron ore import of over 9 million tons in 1964 as well as manganese ore imports of 380,000 tons in 1964 was expected to increase due to the impracticality of raising domestic production to meet planned expansion of steel production facilities. The largest of these facilities, the Lenin Metallurgical plant at Nowa Huta with an ingot steel capacity of about 2.4 million tons in 1964 was to be expanded to a capacity of about 8 million tons by 1970. In 1964 nearly 40 percent of the pig iron produced in Poland, 30 percent of the steel and 98 percent of all cold-rolled products were produced in the Lenin plants.

At full capacity, now planned for 1970, the Lenin Metallurgical Combine will annually produce 3.5 million tons of cold-rolled sheet, 720,000 tons of coated sheet, 2 million tons of pressed sheet, 200,000 tons of electrical sheet, and 300,000 tons of welded pipe. Emphasis on developing production facilities for more sophisticated steel products reflected Polish plans for a marked cut in heavy and costly imports in these lines.

Construction was underway on the fifth blast furnace at the Lenin plant. The furnace will have a capacity of 2,000 cubic meters and produce 1 million tons of pig iron annually.

At yearend an oxygen converter steel facility, Poland's first, was under construction at the Lenin metallurgical plant. Completion was scheduled for early 1965 at a cost of Zl2.5 billion. This facility was scheduled to produce 300,000 tons of steel in 1965; however, it appeared doubtful that production would commence as planned, as the Polish press reports delays in equipment, machinery, and supply deliveries to the construction site.[5]

The Zawiercie metallurgical plant, with an annual capacity of about 200,000 tons of steel in 1964 was to be expanded to a 800,000-ton annual capacity presumably by the end of the 5-year plan ending in 1970. During the second half of 1964, two residual fuel oil-fired 100-ton Martin furnaces were commissioned at Zawiercie as part of the development program.

During 1964, 27 open hearth furnaces were converted to residual oil fuel and produced 2.6 million tons of steel or 30 percent of total 1964 output.

Lead and Zinc.—The slight increase in lead-zinc ore extraction in 1964 was attributable to greater use of longwall mining methods in Poland's seven lead-zinc mines.

An integrated lead-zinc smelter under construction in Miasteczko continued under development in 1964 but was not likely to be completed in 1965 as scheduled. The Polish press reported a lack of qualified workers as well as delays in supply of construction materials and equipment to this smelter, which is to use the Imperial smelting process.

Inadequate domestic smelting facilities forced Poland to continue as an exporter of lead concentrate (6,139 metric tons in 1964) and an importer of lead metal (20,865 tons in 1964). In contrast, production of zinc concentrates was insufficient to supply domestic zinc smelters and refineries requiring a large import of zinc concentrate, 167,000 tons in 1964. Zinc exports for 1964 totaled 98,000 metric tons, an 11-percent increase over that in 1963.

---

[5] Trybuna Ludu (People's Tribune), (Warsaw, Poland). Aug. 8, 1964.

NONMETALS

Cement.—The Warta cement plant at Dzialoszyn began operation in May with an annual capacity of 700,000 tons of clinker, 575,000 tons of "350" portland and 435,000 tons of "250" metallurgical-grade cement.[6]

At yearend the 1.2 million-ton annual capacity Rudnik cement plant near Czestochowa remained under construction, the target completion date having been advanced from mid-1964 to mid-1965. This plant represents initial attempt at dry process cement production in Poland. Principal output of the plant will be high-grade metallurgical cement.[7]

White cement production was introduced to the Polish industry in 1964 by the Wejherowa cement works. Production amounted to 5,000 tons in 1964 with planned production set at 15,000 tons for 1965.

Fertilizers.—Expansion of existing chemical fertilizer installations and construction of new facilities were carried out in support of increasing agricultural demand.

A second nitrogen fertilizer plant at Pulawy was under construction with completion scheduled for 1968. Both plants used natural gas piped from the U.S.S.R. The nitrogen fertilizer production goal for 1970 has been set at 1 million tons in terms of nitrogen content.

The phosphatic fertilizer plant at Szczecin produced 173,000 tons of powdered superphosphate. Plans included expansion of this facility to a 200,000-ton annual capacity.

The 1964 plan for fertilizer production included 365,000 tons of contained nitrogen in nitrogenous fertilizers and 320,000 tons of contained phosphorus pentoxide (P_2O_5) in phosphatic fertilizers.

Lime.—A new lime processing plant was under construction at Bukowa. When completed, it will have an annual capacity of 300,000 tons. Raw material to supply the plant was to be supplied from the Bukowa limestone deposits, where extraction of limestone is expected to reach 1 million tons annually.

The Kujawy plant near Inowroclaw has been mechanized and reportedly produced 200,000 tons of lime fertilizer, a little more than a third of the national total. Plans for expansion of this plant to a 600,000-ton annual capacity were announced.

Other limestone deposits occur in Koszalin province in northwest Poland. Exploitation began at Walcz where about 15,000 tons of fertilizing lime was obtained in 1964.

Salt.—The principal salt mining areas were Klodawa, Bochna, and Wieliczka. A new salt mine in the Kujawy area near Inowroclaw was under development with operation scheduled for 1967. Pipes will be employed to transport water to the mine depths and return brine to surface tanks.

---

[6] Fundamenty (Warsaw, Poland). May 17, 1964, p. 3.

[7] Trybuna Ludu (People's Tribune), (Warsaw, Poland). June 4, 1962, p. 1; Feb. 28, 1964, p. 1; Jan. 17, 1965, pp. 1, 6.

Sulfur.—To assure a continued exportable surplus of sulfur, a second mine at the Tarnobrzeg deposit was under development. When completed in 1970, this mine, situated on the East bank of the Vistula at Machow, will produce 6.5 million tons of sulfur ore annually. At the established mine on the West bank at Piaseczno, the ore yield was reported to be 2 million tons in 1964.[8] The Piaseczno mine may be depleted by 1970, at which time the Machow mine was scheduled to open.

A second plant at Tarnobrzeg for processing sulfur ore continued under construction, with completion anticipated in mid-1965. A small sulfuric acid plant came on stream in late 1964 at Lubon near Poznan. The Lubon plant had a reported capacity of 100,000 tons of acid annually.

MINERAL FUELS

Coal.—Poland's coal-based energy supply continued to lag behind increasing industrial demands in 1964, in spite of extensive exploration and development. The Rybnik coking coal basin was the focal point of development. During the year Zl 3 billion was expended in developing the basin. Funds were allocated for the expansion of nine old mines and the continuing development of the following mines: May 1, Szczydlowice, Jastrzebie, Moszczenia, Zofiowka, and Boryni. Already in partial operation, the May 1, Szczydlowice, and Jastrzebie mines together produced an average of 4,700 metric tons of coal per day in 1964.[9]

The Rybnik basin, where coal reserves are reported to total 10,000 million tons, reportedly will require a total investment of Zl 100,000 million by 1980. Investment is to cover development of 20 new mines with a total capacity of 95,000 tons per day and expansion of the old mines at Rybnik to raise daily capacity to 145,000 tons.[10]

The Turow basin supplied more than half of the brown coal production. Under construction and expansion, the Turow basin reportedly achieved 50 percent of its new planned capacity in the fall of 1964.[11]

Coke.—Coke production barely reached the 1964 plan level of 14.2 million tons. This figure included 8.3 million tons of metallurgical coke, about as much as was produced in 1963. This output should have satisfied demand, particularly as consumption of coke per ton of pig iron produced dropped from 918 kilograms in 1963 to 880 kilograms in 1964.

Construction was underway on a new coking plant at Zczieszowice. When completed (target completion date not reported) it will have a capacity of 10 million tons annually. This capacity equals that of the largest existing coking plant, at Nowa Huta.

Petroleum and Natural Gas.—Hoping to increase petroleum reserves, the Poles, in cooperation with the U.S.S.R., conducted extensive exploration. Small fields were reportedly discovered during the year in the Rzeszow area in Southeastern Poland. While several wells have been commissioned near Bochna, crude output in 1964 was less than

---

[8] Trybuna Ludu (People's Tribune) (Warsaw, Poland). Jan. 9, 1964, p. 1.
[9] Trybuna Ludu (People's Tribune) (Warsaw, Poland). Apr. 12, 1964, p. 1.
[10] Trybuna Ludu (People's Tribune) (Warsaw, Poland). Oct. 8, 1964, p. 3.
[11] Trybuna Ludu (People's Tribune) (Warsaw, Poland). Sept. 13, 1964, p. 1.

0.3 million metric tons. Using domestic crude and an added 1.5 million tons of crude imported from the U.S.S.R., Polish refineries yielded nearly 2 million tons of petroleum products or less than a third of the domestic requirement.

In late 1964, a distillation column and a reforming unit were commissioned at Plock. The plant will be Poland's largest refinery by 1965 when it should account for 41 percent of petroleum product output by value and 60 percent of total crude process in Poland.[12]

A 25-percent increase in gas production over that in 1963 was attributed to further completion of gas pipelines and the discovery of new deposits in Lubaczow, Rzeszow, and Jaroslaw.

---

[12] Zycie Gospodarczie No. 4, Warsaw, Poland. Jan. 24, 1965, p. 3.

The Mineral Industry of Portugal

By Stephen C. Brown[1]

◆

DURING 1964, the continued slow decline of the Portuguese mining industry was offset by the rapid growth of the mineral-processing industries (cement, fertilizers, petroleum refining, and iron and steel), and as near as can be judged the mineral industries as a whole maintained their relative position in the Portuguese economy. In 1963 the mining and mineral processing industries accounted for about 5 to 6 percent of total gross domestic product. According to reports, overall economic growth in 1964 was slightly below the rate of growth in 1963. Preliminary foreign trade data indicate that the value of both mineral imports and mineral exports rose in 1964, most significantly in the case of the latter, but the relative importance of mineral exports in Portugal's balance of payments, never a major contributor, declined as tourism developed as the country's principal foreign exchange earner.

Preliminary outlines of Portugal's new 3-year economic development plan indicated that the bulk of new investment in the mineral sector of the economy is to go into the mineral processing industries, with mining investments held at relatively low levels. The trend towards rapidly growing processing industries and a decline of the mining sector appears thus to be confirmed. During the year the Portuguese Government approved agreements with Belgian and Swedish interests for the importation of Portuguese mine and quarry labor into those countries.

GOVERNMENT POLICIES AND PROGRAMS

In accordance with the provisions of the European Free Trade Area agreement, Portuguese import tariffs on manufactured goods from member countries were again reduced and by mid-1964 reached levels 30 to 50 percent below rates of the General Agreement on Tariffs and Trade (GATT). The effect on mineral commodities will probably be felt chiefly in iron and steel manufactures imports.

The Portuguese Government approved arrangements with the Belgian Coal Mining Federation for the importation of Portuguese miners into Belgium, and with Swedish extractive industries for the importation of Portuguese quarry workers.

---

[1] International economist, Division of International Activities.

The Government also published a draft of its 3-year development plan, covering the years 1965–67, from which some idea of prospective investments in the mineral industries can be obtained. It provides for total investments of $1.2 billion over the 3-year period; the investments allocated to "industry," within which the mineral industries fall, are said to represent estimates of the industries themselves rather than government figures. The figures are as follows: Mining, $21.9 million; solid fuel, $2.0 million; petroleum refining, $47.5 million; petroleum distribution, $20.5 million; chemical manufacturing, $85.8 million; nonmetallic mineral products, $39.5 million; and metallurgic, metal-mechanic, and electric material industries, $193.7 million. The three last categories include the fertilizer, sulfur, cement, nonferrous metal, and iron and steel industries, but also include their advanced states as well as other industries; thus the figures for them cannot be taken as representative of investments in the mineral sector of the economy only. It is significant, however, that the larger investments are projected for the mineral processing industries, while those for the mining industry are small.

PRODUCTION

Available production statistics for 1964 suggest that the output of the mining sector decreased somewhat in volume as compared with 1963 output, but increased by about 8 percent in value, due chiefly to increased unit values for tin and wolfram. In both cases the volume of output was only slightly higher than in 1963. Pyrites production was only marginally higher, while its value was down.

In contrast, both the volume and value of output of the mineral-processing industries showed substantial gains, with the iron and steel, cement, fertilizer, and petroleum refining industries all recording significant increases in production. The trend towards a slowly declining mining output and a rapidly growing mineral-processing sector thus continued.

TABLE 1.—Portugal: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964[p]
Metals:					
Aluminum and alloys, secondary	288	399	303	354	260
Antimony concentrates (50 percent Sb)	----	----	----	----	21
Arsenic, white	735	300	575	564	3,800
Beryl, 10 percent BeO	29	35	17	2	18
Columbite-tantalite, 70 percent $Cb_2O_5+Ta_2O_5$	25	19	15	10	NA
Copper:					
Mine (metal content)	3,417	3,040	3,395	3,290	NA
Refined	5,274	5,846	4,766	4,548	3,390
Alloys, secondary	[r] 2,961	[r] 4,063	[r] 4,076	4,029	NA
Gold:					
Mine troy ounces	21,927	22,377	21,927	21,895	21,219
Refined do	2,508	3,858	2,572	1,222	NA
Iron and steel:					
Iron ore, 50 percent Fe thousand tons	302	234	233	225	172
Manganiferous iron ore (45 percent Fe, 7 percent Mn) thousand tons	----	----	----	----	43
Pig iron do	39	120	222	237	264

See footnotes at end of table.

TABLE 1.—Portugal: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964[p]
Metals—Continued					
Iron and steel—Continued					
Ferroalloys:					
Ferromanganese	----------	----------	399	717	5,379
Ferrosilicon	----------	----------	2,832	4,944	
Steel ingot and equivalent forms thousand tons	----------	92	167	[r] 213	241
Semimanufactures do	----------	15	[r] 148	[r] 172	256
Lead:					
Ore (metal content)	31	25	44	224	[r] 323
Metal:					
Primary	905	1,509	2,020	1,118	1,150
Secondary	1,970	2,690	1,038	1,279	[e] 2,100
Manganese ore, 38–42 percent Mn	7,436	11,333	11,490	8,558	6,883
Silver:					
Mine troy ounces	[r] 52,920	[r] 48,258	[r] 52,920	[r] 48,419	48,775
Refined do	[r] 332,824	[r] 303,471	[r] 177,825	[r] 115,807	NA
Tin:					
Concentrate (metal content) long tons	772	729	679	718	657
Refined do	601	784	766	766	568
Titanium ore, ilmenite 50 percent TiO_2	909	99	68	41	33
Tungsten concentrate:					
Scheelite, WO_3 content	41	45	35	----------	1,059
Wolframite, WO_3 content	1,709	1,737	1,467	971	
Zinc ore (metal content)	----------	----------	11	172	952
Nonmetals:					
Barite	3,910	2,073	1,351	1,658	347
Cement thousand tons	1,202	1,244	1,401	1,433	1,622
Clays do	397	549	273	222	NA
Diatomaceous earth	1,063	768	1,450	1,875	1,890
Dolomite	2,600	2,750	3,800	3,920	NA
Feldspar	1,726	2,938	3,733	402	NA
Gypsum	61,637	71,949	72,259	60,090	NA
Kaolin:					
Washed, 98 percent	28,871	29,765	30,715	37,985	26,071
Impure, 30 percent	17,995	19,914	12,775		12,222
Pyrites, cupriferous	654,922	652,921	641,293	602,068	607,429
Quartz	8,072	18,844	11,292	10,397	NA
Quartzite	7,365	1,700	9,022	23,534	NA
Salt:					
Evaporated thousand tons	236	267	315	268	NA
Rock salt do	48	73	74	79	NA
Sand and gravel do	330	315	420	359	NA
Stone:					
Marble do	28	19	23	41	NA
Granite do	322	426	540	447	NA
Slate do	57	83	86	76	NA
Limestone and marl do	2,069	2,655	2,944	1,917	NA
Porphyroids and schists do	232	173	164	161	NA
Other stone do	49	58	49	49	NA
Sulfur, refined	11,090	8,954	6,784	3,000	NA
Talc	680	720	326	540	790
Mineral fuels:					
Coal:					
Anthracite thousand tons	435	470	405	416	444
Lignite do	156	158	153	142	102
Briquets do	41	38	45	42	38
Coke, gas do	39	40	31	25	10
Petroleum refinery products:					
Gasoline do	299	327	362	380	379
Kerosine do	206	168	153	166	184
Jet fuel do	17	9	12	32	29
Gas oil do	259	259	256	290	308
Residual fuel oil do	454	451	456	510	570
Butane and propane gases do	41	43	50	56	43
Other petroleum gases do	27	22	17	20	28
Other petroleum products do	17	16	19	17	16

[r] Revised. [p] Preliminary. [e] Estimate. NA Not available.

TRADE

Exports of minerals and mineral products from Portugal in 1963, totaling $31.8 million, increased by 14 percent in value compared with 1962 exports but remained at about 7.5 percent of total exports; the increase was more than accounted for by the rise in exports of the fertilizer and petroleum refining industries. Exports of the metal mining industries declined, sharply in the case of iron ore, pyrites, and tin; while exports of building stone (marble and granite) rose significantly and increased their lead as the most valuable single export item of the mining sector. Exports of ferroalloys, pig iron and castings, iron and steel semimanufactures, and ores of manganese, titanium, vanadium, and zirconium rose in both volume and value. Imports of minerals and mineral products in 1963, valued at $134.3 million, increased by about 6 percent in value over 1962 levels, the rise being accounted for chiefly by increased imports of mineral fuel and fertilizer commodities. Imports of iron ore rose sharply to over 20,000 tons. Mineral imports in 1963 comprised about 21 percent of total imports; four-fifths of the value of mineral imports was accounted for by crude petroleum and refined products, coal and coke, and iron and steel.

Despite the larger 1963 increase in value of mineral exports, the total value of mineral imports remained more than four times that of mineral exports.

Preliminary 1964 foreign trade data indicate another significant rise in the total value of mineral exports, again accounted for chiefly by sharp rises in the volume and value of the exports of the mineral-processing sector. Exports of cement more than doubled in volume, exports of fertilizers increased by about 26 percent, exports of petroleum products by 6 percent, and exports of pig iron by about 7 percent. Of mining industry products, exports of pyrites increased sharply in volume and value, and exports of wolfram ores and tin metal were up somewhat in volume but sharply in value due to higher prices for these materials. Imports of minerals apparently showed a somewhat smaller increase in volume and value, with imports of fertilizer raw materials down from those of 1963 and imports of fuels little changed in volume and value (imports of coal declined, those of coke increased, while imports of crude petroleum and refined products were down slightly); imports of metals and semimanufactures showed substantial increases. Sufficient data are not available to estimate 1964 mineral trade changes as percentages of total foreign trade, or to ascertain changes in relationships between mineral exports and mineral imports. It is apparent, however, that the trend towards a slowly declining mining sector and a flourishing mineral-processing sector has continued. Increasing industrialization, which began on a significant scale in 1964, points to a growing mineral import balance as economic development proceeds.

TABLE 2.—Portugal: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum, all forms	66	124	Italy 64; Angola 31; United Kingdom 19.
Arsenic, white	1,117	713	Italy 370; Spain 230; New Zealand 63.
Beryl	44	----------	
Copper:			
Ore and concentrate	2,136	2,188	All to West Germany.
Metal, all forms	565	329	Italy 220; United Kingdom 40; Angola 24.
Iron and steel:			
Iron ore	99,508	72,923	Belgium-Luxembourg 34,573; United Kingdom 30,017; Italy 4,800.
Pyrites, roasted	29,373	15,650	West Germany 15,100; Sweden 550.
Scrap	15,019	18,380	Italy 10,250; Spain 5,120; Sweden 2,900.
Pig iron and rough castings	10,177	16,397	Italy 15,090; Belgium-Luxembourg 702; Israel 521.
Ferroalloys:			
Ferrosilicon	2,411	3,470	West Germany 2,192; Belgium-Luxembourg 1,160; Israel 110.
Other	26	50	All to West Germany.
Steel:			
Ingots and other primary forms.	48,598	11,132	Burma 5,035; Spain 4,995; Mozambique 1,010.
Tubes, pipes and accessories	3,473	7,178	Mozambique 1,612; Angola 1,360; Kuwait 962; West Germany 665.
Other semimanufactures	1,936	1,902	Angola 727; Libya 213; Portuguese Guinea 201; Cape Verde 127; West Germany 120.
Lead, wrought and unwrought	27	51	Angola 15; Mozambique 11; United Kingdom 10.
Manganese, ore and concentrate	880	6,145	Spain 5,572; Netherlands 573.
Nickel, all forms	2	2	United Kingdom 1.
Platinum and platinum group metals, all forms. troy ounces	337	542	All to United Kingdom.
Silver, all forms troy ounces	804	96	Various.
Tantalum, ore and concentrates	43	31	All to United States.
Tin:			
Ore and concentrates long tons	NA	116	Spain 59; United Kingdom 57.
Ashes and residues do	1,244	403	Spain 202; United Kingdom 187; Netherlands 15.
Metals, all forms do	910	246	United States 157; Angola 30; Netherlands 25; United Kingdom 9.
Titanium, vanadium, and zirconium, ores and concentrates	50	2,363	Spain 2,293; France 70.
Tungsten, ore and concentrate	2,041	1,219	United Kingdom 573; United States 304; Netherlands 71; Japan 51.
Zinc:			
Ore and concentrate	NA	391	All to Spain.
Ashes and residues	208	429	Belgium-Luxembourg 337; Netherlands 92.
Metal, all forms	5	51	Netherlands 41; Mozambique 7.
Ashes and residues of metallic ores, not further described.	1,178	128	United Kingdom 68; United States 30; Italy 16.
Nonmetals:			
Barite	5	5	All to Mozambique.
Cement, hydraulic	179,430	176,572	Spain 154,274; Gibraltar 9,980; Cape Verde 5,680; Portuguese Guinea 4,771.
Clays:			
Kaolin	15,739	13,005	Italy 10,300; France 2,600.
Other	297	164	Angola 104; Mozambique 28; San Tome 14, Spain 10.
Diatomaceous earth	288	279	United Kingdom 151; Netherlands 78; Angola 22; Venezuela 14.
Fertilizers and fertilizer raw materials:			
Nitrogenous	[r] 42,518	74,483	Spain 28,073; South Africa 20,950; South Viet-Nam 19,800; United Kingdom 3,209.
Phosphatic:			
Superphosphates	56,216	92,879	Indonesia 29,976; Yugoslavia 20,461; Chile 14,900; South Korea 10,000.
Other	9,645	3,260	New Zealand 3,148.
Potassic	130	135	Mozambique 69; San Tome 33; Angola 22.
Flint	2,767	1,708	Mozambique 728; Cape Verde 413; Angola 288; United States 138.
Gypsum	228	305	Mozambique 150; Angola 130.
Lime, hydraulic	1,168	1,231	Mozambique 812; San Tome 237; Portuguese Guinea 142.
Mineral pigments	64	62	Angola 29; Mozambique 15; Cape Verde 7.
Pyrites, unroasted	292,082	273,996	Belgium-Luxembourg 167,971; West Germany 64,190; France 28,694; Netherlands 12,870.

See footnotes at end of table.

TABLE 2.—Portugal: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Nonmetals—Continued			
Quartz and quartzite	3,455	3,469	Italy 2,909; West Germany 560.
Salt	2,306	82	Bunkers 60; Angola 15; Mozambique 6.
Shale (slate)	8,634	8,652	Belgium-Luxembourg 3,076; United Kingdom 2,594; Denmark 733; United States 733.
Stone, building and monumental	77,910	88,612	Italy 67,911; West Germany 7,240; Belgium-Luxembourg 5,585; Netherlands 2,559.
Sulfur	323	29	Angola 17; Mozambique 10.
Other nonmetals	r 834	1,294	United Kingdom 845; West Germany 172; Netherlands 123; Angola 58; United States 22.
Mineral fuels:			
Coal, all grades	r 1,652	942	Bunkers 816; Cape Verde 105.
Coke and semicoke	4	26	Angola 25.
Other coal products	27	45	Angola 19; Mozambique 10.
Petroleum refinery products:			
Gasoline	47,483	47,898	United Kingdom 20,132; Nigeria 13,585; Portuguese Guinea 5,348; Ivory Coast 4,674; Senegal 3,556.
Kerosine	r 28,697	45,317	Denmark 18,063; Netherlands 11,684; United Kingdom 11,618.
Distillate fuel oil	41,887	57,249	United Kingdom 15,182; Morocco 10,366; Nigeria 8,525; Congo (Léopoldville) 5,464; Portuguese Guinea 4,717.
Residual fuel oil	34,189	61,078	Morocco 23,412; West Germany 15,890; Algeria 9,159; United Kingdom 5,091; Tunisia 3,556.
Jet fuel	NA	7,972	Bunkers 7,821; Portuguese Guinea 151.
Other oils	NA	59	All to Portuguese Guinea.
Lubricants	1,618	2,401	Mozambique 998; Angola 850; Portuguese Guinea 226; Bunkers 162.
Liquefied petroleum gases	NA	237	Portuguese Guinea 90; Angola 63; Mozambique 46; Cape Verde 38.
Other	97	397	Portuguese Guinea 137; San Tome 110; Cape Verde 77; Angola 41; Mozambique 27.
Carbon black	11	9	Mozambique 5.

r Revised. NA Not available.

TABLE 3.—Portugal: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Bauxite	2,115	3,245	France 1,833; British possessions in Central and South America 1,162.
Metal, including alloys:			
Ingots and scrap	1,474	1,108	France 520; Canada 370; Norway 14; United States 13.
Semimanufactures	3,696	4,959	Austria 1,221; United Kingdom 1,100; West Germany 752; Belgium-Luxembourg 651.
Arsenic, white	5	1	Mainly from West Germany.
Copper:			
Ore and concentrate	9,205	10	All from United Kingdom.
Matte	120	22	All from Angola.
Metal:			
Blister	2,640	803	Rhodesia and Nyasaland 508; Angola 295.
Refined	3,243	3,723	Belgium-Luxembourg 1,973; Canada 814; United Kingdom 550.
Scrap	909	1,092	United Kingdom 655; France 139; Angola 138; Belgium-Luxembourg 56.
Semimanufactures, including alloys.	3,531	4,665	United Kingdom 1,837; Italy 890; West Germany 759; Belgium-Luxembourg 267.
Gold, crude and semiwrought. troy ounces	465	1,026	Belgium-Luxembourg 980.
Iron and steel:			
Iron ore	34	20,807	Spain 20,188.
Scrap	1,126	1,362	United Kingdom 484; Angola 411; United States 291; Portuguese Guinea 82.
Pig iron and rough castings	1,242	229	Norway 199; Netherlands 20; France 7.
Ferroalloys	391	418	Norway 162; United Kingdom 67; Sweden 60; West Germany 56.

TABLE 3.—Portugal: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Steel:			
Ingots and equivalent primary forms.	[r] 154	[1] 869	United Kingdom 847.
Bars, rods, angles, shapes, and sections.	83,355	64,660	Belgium-Luxembourg 27,691; West Germany 11,832; United States 9,265; France 7,279; United Kingdom 6,892.
Plates and sheets, uncoated	[r] 24,617	29,469	Belgium-Luxembourg 9,032; France 6,144; West Germany 5,523; United Kingdom 4,316; Netherlands 2,583.
Tinplate and galvanized plate	[r] 79,995	90,701	West Germany 26,968; France 21,464; United Kingdom 15,214; United States 6,330.
Hoop and strip	34,583	41,584	France 14,769; Belgium-Luxembourg 13,588 Netherlands 1,225; Italy 475.
Wire	[r] 9,525	10,070	Belgium-Luxembourg 3,768; United Kingdom 2,828; West Germany 1,296; Norway 907; United States 528.
Other semimanufactures	14,223	10,814	West Germany 3,285; France 2,278; United Kingdom 1,310; Italy 944; United States 549.
Lead:			
Ore and concentrate	447	NA	
Ingot and scrap	[r] 6,536	7,954	Mexico 4,456; Spain 2,933; United Kingdom 157; Belgium-Luxembourg 145.
Magnesium, all forms	9	6	United Kingdom 4.
Manganese, ore and concentrate	195	207	West Germany 86; United Kingdom 43; Netherlands 30; Belgium-Luxembourg 20.
Mercury 76-pound flasks	438	305	Spain 189; Italy 116.
Nickel, all forms	204	124	United Kingdom 64; West Germany 28; Netherlands 13.
Platinum and platinum group metals, all forms. troy ounces	130	1,127	United Kingdom 1,121.
Silver, all forms troy ounces	1,372,457	1,065,635	United Kingdom 796,481; West Germany 266,389.
Tin:			
Ore and concentrate long tons	265	----------	
Metal, scrap and semimanufactures. do	[r] 18	24	United Kingdom 11; Netherlands 4; West Germany 3.
Titanium, vanadium, molybdenum, tantalum, and zirconium, ores and concentrates	548	563	Australia 137; United Kingdom 25.
Zinc:			
Ingots and scrap	4,625	5,088	Spain 2,301; Belgium-Luxembourg 2,228; West Germany 206; Netherlands 152.
Semimanufactures	245	268	West Germany 230; Belgium-Luxembourg 14; Spain 11; United Kingdom 8.
Other ores and concentrates	[r] 337	420	Australia 394.
Other metals	[r] 113	83	West Germany 58; Netherlands 16.
Nonmetals:			
Asbestos	2,719	1,846	South Africa 789; Rhodesia and Nyasaland 558; Canada 309.
Barite	89	66	West Germany 64; United Kingdom 2.
Cement, hydraulic	1,083	645	France 414; West Germany 108; United Kingdom 80.
Chalk, including ground	1,234	1,295	France 730; Belgium-Luxembourg 466; Norway 99.
Kaolin	225	281	United Kingdom 207; United States 60.
Bentonite	1,370	1,343	West Germany 472; United States 365; Morocco 350; Algeria 131.
Other refractories	964	458	Spain 288; West Germany 110; United Kingdom 41.
Other	1,493	2,723	United Kingdom 2,527; West Germany 129.
Corundum, natural	450	552	Italy 212; Netherlands 143; United Kingdom 83; West Germany 60.
Diatomaceous earth	652	861	United States 479; France 211; Italy 86; United Kingdom 24.
Dolomite	662	605	Norway 349; Italy 185; Austria 40.
Feldspar	486	570	United Kingdom 220; Spain 200; West Germany 100.

See footnotes at end of table.

TABLE 3.—Portugal: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals—Continued			
Fertilizer and fertilizer raw material:			
Nitrogenous:			
Sodium nitrate	r 4,669	12,725	Nearly all from Chile.
Ammonium nitrate	1,600	10,653	Austria 10,200; France 250; Belgium-Luxembourg 200.
Phosphatic:			
Phosphate rock	242,213	273,298	Morocco 273,248; Netherlands Antilles 50.
Thomas slag	9,501	10,059	Belgium-Luxembourg 9,264; France 795.
Other	11,688	1,979	Senegal 1,680; France 250.
Potassic:			
Potassium chloride	14,113	21,741	Spain 21,740.
Other	1,150	1,350	All from Spain.
Flint	115	436	Belgium-Luxembourg 349; France 41; West Germany 30.
Graphite, natural	114	106	West Germany 61; United Kingdom 16; Norway 12; Austria 11.
Gypsum	12,805	11,350	Morocco 11,240.
Magnesite, natural	1,084	762	Austria 553; Netherlands 164; West Germany 23.
Mica	129	93	Norway 84; United Kingdom 9.
Mineral pigments	88	126	France 67; West Germany 17; Spain 20.
Salt	5,869	11,680	Cape Verde 11,600.
Sand	1,196	2,380	Belgium-Luxembourg 2,034; Spain 200.
Stone, building and monumental	476	249	Norway 130; Spain 41; Angola 33; Sweden 25.
Sulfur	20,944	32,104	France 28,901; West Germany 2,936.
Talc and steatite	1,207	1,380	France 629; Norway 427; Italy 280.
Other	r 150	r 151	West Germany 61; Denmark 40; United Kingdom 16.
Mineral fuels:			
Coal, all types	372,002	458,523	United States 223,045; United Kingdom 121,728; Poland 62,083.
Coke and semicoke	176,261	208,994	United Kingdom 174,525; West Germany 23,542; United States 9,108.
Coal tar and mineral tar	2,976	2,030	Italy 2,000; United Kingdom 30.
Petroleum:			
Crude	1,333,952	1,497,681	Iraq 1,065,427; Angola 207,297; Algeria 205,355.
Refinery products:			
Gasoline	r 23,659	21,975	Netherlands Antilles 12,720; Curacao 9,048.
Kerosine	43,417	23,417	Curacao 10,537; Netherlands Antilles 5,037; Iran 2,102; Venezuela 1,754.
Distillate fuel oil	430,207	425,943	Netherlands Antilles 95,307; Curacao 57,182, Iran 52,184; Rumania 44,983.
Residual fuel oil	r 141,418	190,816	Angola 49,015; Netherlands Antilles 35,079; Iran 34,517; Netherlands 23,061; Mozambique 15,697.
Liquefied petroleum gas	18,910	28,055	France 26,320; United Kingdom 1,294.
Lubricants	33,738	36,942	United States 15,110; United Kingdom 11,083; Netherlands 7,386.
Jet fuel	5	685	Curacao 374; Netherlands Antilles 311.
Other	59,249	50,369	United States 21,287; Spain 11,564; Curacao 9,726; Hungary 2,931.
Carbon black	2,299	3,193	United States 1,063; United Kingdom 833; Netherlands 595; France 524.

r Revised.

[1] Chiefly coils for rerolling (832 tons); all from United Kingdom.

COMMODITY REVIEW

METALS

Iron and Steel.—Ingot output of Siderurgia Nacional increased to 207,000 tons, and the new cold-rolled strip-steel mill of F. Ramada Acos e Industrias S.A.R.L. at Ovar, near Oporto, went into operation. The domestic industry was said to have absorbed the total output of 42,870 tons of "ferromanganese" (a manganiferous iron ore containing 45 percent Fe and 7 percent Mn) produced at the Cercal do Alentejo mines.

Tin and Tungsten.—Steep rises in tin and tungsten prices were reflected in higher export values, but, according to reports, not enough time had passed for these price increases to have had much effect on output. Portuguese output of wolfram ores was expected to reach about 2,500 tons per year in 1965, and perhaps 3,500 tons in 1966 if favorable prices hold; the bulk of 1964 production was said to have come from the Beralt Tin and Wolfram Ltd. Panasqueira mine. Plans of Metallium Corporation to increase output of tungsten ores beginning in July 1964 were reported to have been postponed because of the company's greater activity in tin ores. A U.S. group was said to be negotiating with Mason and Barry for purchase of a wolfram mine at Gerez.

Other Metals and Pyrites.—Mining operations at the Sâo Domingos pyrites mine of Mason and Barry (which produced 98,913 tons in 1964) are to cease in 1965 due to lack of reserves, but leaching for the copper content, by a process developed by the company and its consultants and planned to begin in October 1965, is expected to recover about 4,500 tons of copper over a 4-year period. Major operating pyrites mines in 1964 were the Sâo Domingos, Aljustrél, and Lousal properties.

Compagnie Royale Astrienne des Mines S.A. started exploitation of lead ores at Terramonte, near Oporto, and of zinc ore in Alentejo province.

After carrying out a geophysical survey the Fomento Mineiro drilled two holes near Portel, in Alentejo province, breaking through a dolomitic formation containing pyrites, blende, galena, and calcopyrites. Additional holes were being drilled.

MINERAL FUELS

Petroleum.—In 1964, the only Portuguese refinery, belonging to Sociedade Anonima Concessionairi de Refinacao de Petroleos em Portugal (SACOR), consumed 1,352,015 metric tons of crude oil (all imported) in refining products for domestic consumption. Total domestic consumption of refined products was 1,503,487 metric tons. During 1964 Shell, Mobil, and British Petroleum Co., Ltd. signed contracts with SACOR for participation in the new refinery to be built at Oporto. According to reports the refinery will have a 40,000-barrel daily capacity and is to go on stream in late 1966. The Shell contract is said to provide for the refining of 4,500,000 metric tons of crude for Shell over the next 10 years; the other contracts are believed to be of similar nature and reportedly involve agreements for crude supply and provision of credits against reimbursement from future sales of refined products. Meanwhile, the letting of contracts for an oil-fired thermal powerplant near Lisbon, designed for an ultimate capacity of 500 megawatts (with a first unit of 125 megawatts), marked Portugal's first major venture into the expansion of thermal power and indicated possibilities of growing demand for petroleum from this industry. Esso Standard Portugal, hitherto operating as a direct company subsidiary and limited to implementing lubricating oil contracts at Lisbon and in the Azores, reorganized as a corporation under Portuguese law, thus becoming eligible for rights to distribute finished products.

SOURCE MATERIAL

Production data for Portugal have been obtained largely from the official Estatistica Industrial of the Instituto Nacional de Estatistica and foreign service dispatches from the U.S. Embassy, Lisbon. In a few cases they have been estimated on the basis of partial data. Trade data are derived from the official trade statistics published by the Instituto Nacional de Estatistica. Information on developments in the minerals industry is derived principally from foreign service dispatches of the U.S. Embassy.

The Mineral Industry of Rumania

By Roman V. Sondermayer[1]

◆

RUMANIA'S petroleum production continued to be its only major contribution to world mineral supplies, but large-scale efforts to develop other mineral resources and construction of a new large steel complex were in progress. In 1964, Rumanian crude oil output again ranked second in Europe to that of the U.S.S.R. but totaled only about 12 million tons, roughly 5 percent of the Soviet output. In other sectors of the mineral industry the manufacturing base was expanded, and efforts were made to develop domestic resources. In spite of exploration, the domestic raw material position did not show great improvement, and most of the needs were covered by imports.

Mineral and metal output value in 1964 was about 10 percent more than that in 1963. The estimated share of the mineral industry in the 1964 gross national product was roughly 18 percent. Approximately one-seventh of the total labor force, or 230,000 laborers, was employed in the mineral industry. Mineral trade was modest by world standards. Export of petroleum refinery products, over 6 million tons, represented an important source of foreign currency. Imports provided the majority of semimanufactured iron, steel, and nonferrous metal products needed in the country.

Important developments in 1964 included continued construction of the Slatina aluminum plant and the Galati steel mill, expansion of the Hunedoara iron and steel plant, continued construction of the Copsa Mica lead and zinc smelter in Transylvania, opening of an old copper mine near Mercurea Ciuc, and construction of facilities for copper production in Moldava Nouva in Banat.

Development by the petroleum industry was limited chiefly to existing geological structures and plants. No significant new discoveries were reported, and activities were confined largely to extension of existing fields, introduction of secondary recovery and automation. The petroleum refining industry met the planned targets. A new addition was commissioned at the refinery at Prahova Valley for production of lubricants.

GOVERNMENT POLICIES AND PROGRAMS

Industrial development and development of the mineral industry were and are the primary targets of the Rumanian regime. Rumania refused to follow the so-called "division of labor" between the Eastern European Communist countries. The effort to achieve more independent stature was reflected in the extensive planned development of domestic mineral resources and heavy industry, a trend expected to continue in the future.

---

[1] Foreign mineral specialist, Division of International Activities.

PRODUCTION

Output of most mineral and metal products in Rumania increased in 1964. The increase in production of petroleum, the country's leading mineral product, was relatively modest.

Mechanization of mines was inadequate and efforts were made to improve the situation, but at yearend the mines could not be considered well mechanized.

Technologically, drilling for oil was advanced compared with that of other Communist countries. Most of the drilling was performed with Soviet-made turbodrills. Crude oil production technology was on a rather high level, and partial automation was introduced in certain fields. Most of the production was obtained from flowing and pumping wells.

TABLE 1.—Rumania: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1960	1961	1962	1963	1964 [e]
Metals:					
Aluminum:					
Bauxite	88,000	69,000	30,000	[r] 10,000	[e] 10,000
Iron and steel:					
Iron ore ... thousand tons	1,460	1,737	1,738	2,286	1,946
Pig iron ... do	1,014	1,099	1,511	1,706	1,924
Steel ingot ... do	[r] 1,806	[r] 2,126	[r] 2,451	[r] 2,704	[e] 3,039
Rolled products ... do	1,254	1,518	1,665	[r] 1,918	[e] 2,200
Pipe ... do	338	401	456	478	500
Manganese	174,971	206,000	189,000	260,000	250,000
Mercury ... 76-pound flasks	413	350	222	194	190
Lead (smelter) [e]	12,000	12,000	12,500	12,500	12,700
Silver [e] ... thousand troy ounces	643	643	643	643	643
Nonmetals:					
Cement ... thousand tons	3,054	3,308	3,489	4,369	[e] 4,752
Fertilizers:					
Nitrogenous (Nitrogen content)	18,940	29,934	43,950	[r] 84,850	[e] 85,000
Phosphatic (P_2O_5 content)	52,081	56,510	86,597	[r] 99,759	[e] 100,000
Lime ... thousand tons	597	657	677	731	[e] 750
Pyrites (gross weight) ... do	267	263	305	333	333
Salt ... do	1,045	1,330	1,477	1,637	1,809
Sulfuric acid ... do	226	248	326	343	350
Mineral fuels:					
Coal:					
Bituminous including anthracite ... do	4,481	4,902	5,319	5,655	6,623
Brown ... do	537	554	587	558	[e] 560
Lignite ... do	3,145	3,247	3,683	4,054	[e] 4,100
Coke ... do	820	940	1,119	1,141	1,145
Petroleum:					
Crude ... do	11,500	11,582	11,864	12,233	12,395
Refinery products:					
Gasoline ... do	2,792	2,667	2,400	2,434	[e] 2,500
Kerosine ... do	1,289	1,234	1,234	1,084	[e] 1,100
Gas oil ... do	2,376	2,653	2,910	3,110	[e] 3,200
Fuel oil ... do	3,824	3,681	3,952	4,059	[e] 4,100
Carbon black	25,032	28,390	29,521	33,177	[e] 34,000
Natural gas ... million cubic feet	243,304	268,603	329,805	376,970	NA

[e] Estimate. NA Not available.

[r] Revised.

[1] In addition to listed commodities, Rumania produces antimony, asbestos, chromite, copper, gold, gypsum, molybdenum, mica, and zinc but quantitative data on production are not available.

TRADE

General information on the overall mineral trade of Rumania is available; however, no breakdown on destination or origin is reported. Data on trade incorporated in this chapter were compiled in part by using trade information of other countries, particularly the U.S.S.R. Trade in minerals, as in all other commodities, continued to be a state monopoly, planned as a part of overall economic program.

As in past years, most of the foreign trade in minerals was with other European Communist countries, but Rumania made efforts to increase trade with other countries, pressing for greater economic independence from the U.S.S.R.

Rumania traditionally has been a minor mineral trading country. During 1964 approximately two-thirds of the value of Rumanian mineral exports was attributable to petroleum products, of which the largest part went to the Soviet Union. Principal Rumanian imports were iron and steel products and capital goods. Trade with the United States was insignificant as in the past.

TABLE 2.—Rumania: Reported exports of selected metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:		
Bauxite	15,000	8,000
Manganese ore	72,100	72,000
Steel:		
Rolled products	356,000	521,300
Pipes	205,100	213,500
Nonmetals:		
Cement	986,500	1,264,400
Salt	291,800	309,200
Mineral fuels:		
Natural gas million cubic feet	763	761
Petroleum:		
Refinery products:		
Gasoline	1,871,100	1,792,800
Kerosine	601,500	419,200
Diesel oil	1,647,800	1,608,800
Fuel oil	1,467,800	1,644,500
Paraffin	23,400	25,100
Petroleum coke	28,300	55,200
Bitumen (including natural)	99,300	100,900
Carbon black	18,300	17,900

[1] Source does not contain information on countries of destination.

Source: Anuarul Statistic Al RPR.—1964 (Statistical yearbook of R.P. Rumania for 1964).

TABLE 3.—Rumania: Export of selected metals and minerals to the Soviet Union

(Metric tons)

Commodity	1962	1963
Metals:		
Lead, metal	1,400	1,900
Iron and steel:		
Primary forms for rerolling and rolled products	136,700	108,300
Pipes	199,700	204,400
Zinc	1,000	2,000
Nonmetals:		
Cement	555,000	598,000
Minerals fuels:		
Petroleum refinery products:		
Gasoline	1,326,500	1,263,500
Kerosine	242,900	202,400
Diesel fuel	199,700	216,400
Heating oil	43,600	51,000
Lubricants	101,500	132,100
Bitumen	61,500	68,100

TABLE 4.—Rumania: Reported import of selected metals and minerals[1]

(Metric tons)

Commodity	1962	1963
Metals:		
Iron and steel:		
Iron ore	1,920,000	2,236,500
Ferroalloys	35,400	36,900
Rolled products	986,200	945,200
Pipes	101,900	108,500
Nonmetals:		
Fertilizers:		
Apatite concentrate (P_2O_5)	102,800	150,300
Potassic fertilizers (K_2O content)	10,300	[r] 5,800
Nitrogenous fertilizers (N content)	1,200	3,500
Mineral fuels:		
Coking coal	749,900	697,900
Coke	718,700	918,000

[r] Revised.

[1] Source does not contain information on countries of origin.

Source: Anuarul Statistic Al RPR.—1964 (Statistical yearbook of P.R. Rumania for 1964).

TABLE 5.—Rumania: Import of selected metals and minerals from the Soviet Union

(Metric tons)

Commodity	1962	1963
Metals:		
Aluminum:		
Ingots	9,900	8,600
Semimanufactures	605	609
Copper:		
Copper, metal	5,100	5,900
Semimanufactures[1]	2,940	2,038
Iron and steel:		
Iron ore	1,386,000	1,633,000
Pig iron	8,400	90,400
Ferroalloys	30,700	34,500
Rolled products	723,800	679,400
Pipes for oil industry	31,400	28,800
Tin:		
Metal	42	-------------
Semimanufactured products	20	295
Nonmetals:		
Asbestos	4,000	4,500
Apatite concentrate	97,800	93,400
Cryolite	[r] 200	200
Refractories	[r] 17,500	20,200
Sulfur	[r] 3,700	2,400
Mineral fuels:		
Bituminous coal	395,000	190,000
Coke, metallurgical	431,000	618,000
Petroleum:		
Refinery products:		
Lubricants	800	700

[r] Revised.

[1] Includes alloys.

COMMODITY REVIEW

METALS

Although Rumania was not an important producer of metals in terms of total world or even Communist world production, the mining, smelting, and refining of metals was a favored industrial activity in the country. The trend toward more political independence was reflected in efforts to develop facilities for production of ferrous and nonferrous metals.

Rumania continued to produce a wide range of metals, but output generally was not sufficient to meet requirements and demand had to be met by imports. Plans call for large increases of iron and steel, lead, zinc, aluminum, and copper production by end of 1965.

Aluminum.—The construction of the Slatina aluminum plant was progressing according to plans. The facility, designed by the French firm Péchiney, Compagnie de Produits Chimiques et Electromètallurgiques will be highly automated and was planned to have an annual capacity of 50,000 tons of aluminum. Most of the equipment was being manufactured by Rumanian industries; the rest was to be supplied by French, Belgian, West German, and Italian manufacturers. The plant, due to produce its first aluminum in 1965, will use alumina from a plant at Ordea as raw material.

The supply of bauxite for the new aluminum industry was studied carefully. Because the large domestic bauxite deposits contain clay, research has been directed toward washing of bauxite as a method of beneficiation. After completion of experiments on a pilot plant at Chistaga in Crisana Regiune, construction of a new washing plant of Rumanian design was started at Dobresti in 1963. It was expected to supply sufficient upgraded bauxite to the plant at Ordea from the Dobresti washing plant.

Copper.—The new Baia Mare smelter and refinery in the final stage of construction at yearend will have only one operation for processing copper and auriferous concentrates. The plant will be a highly mechanized and automated installation which will yield about 95 percent copper.

A copper mine that was idle and flooded since World War II near Mercurea Ciuc at the foot of the Harghita Mountain range was reopened. The mine will have a capacity of 600,000 tons of ore annually. A beneficiation plant with several flotation lines also was installed. Equipment for the mine and auxiliary facilities was made in Rumania.

At Moldava Nouva, in southwest Rumania, construction of new industrial facilities for copper production started. The complex, which included a mine and a beneficiation plant with grinding and flotation facilities, was scheduled to start production of copper concentrate and pyrite in 1965.

Iron and Steel.—Iron and steel production facilities in Rumania were developed according to plans for the country's industrialization and concurrent increased independence from the U.S.S.R. Existing iron mines and reserves were inadequate for ambitious steel output targets and substantial ore imports had to be made in 1964.

In the Gheler and Teliuc iron mine area, a new iron ore deposit was discovered and production from both underground and open-cut workings was started. A new beneficiation plant at Teliuc continued. The plant was scheduled to begin production in 1964. The plant will produce a concentrate containing 55 percent iron. Most of the Teliuc mine and plant equipment was manufactured in Rumania.

In the Hunedoara iron and steel works, the third 400-ton openhearth furnace was started in the summer of 1964. With this addition, the works—Rumania's largest—had 7 blast furnaces, 13 open-hearth furnaces and 2 ore-dressing plants. The second iron and steel center in the region has been developed at Calan. The two centers together furnish 60 percent of the country's pig iron output, over 63 percent of its steel and 93 percent of its coke.

The construction of the Galati Iron and Steel Works continued on schedule. When completed, a planned capacity of 4 million tons of steel a year will be reached, more than double the 1964 capacity.

Lead and Zinc.—The development of lead and zinc production was intensive with a significant number of plants, mines and other facilities under construction during 1964. Most of the ores containing lead and zinc are polymetallic containing many other metals such as copper, gold, silver and bismuth.

The construction of the Copsa Mica chemical-metallurgical plant with the British Imperial Smelting process continued. Reports indicate that the plant will have an annual output of 50,000 tons of lead and zinc combined and 100,000 tons of sulfuric acid. The same industrial complex included a flotation plant for beneficiation of lead and zinc ores.

A mine put into operation at Ilba, not far from Baia Mare, produced ores containing lead, zinc, and copper.

NONMETALS

The output of nonmetals in Rumania was of little importance by world standards. The cement and mineral fertilizer production were the most active branches of the nonmetals industry.

Cement.—Production of cement was adequate for domestic needs and provided a surplus for export. The development of industry and intensive apartment construction to reduce the severe housing shortage dictated a fast increase of construction material output.

A large industrial complex for production of construction materials was under development in Biresti near Tirgu-Jiu. The complex included a cement and lime plant. The automated, dry-process cement plant was to have an annual capacity of 2 million tons, and was to be equipped with electric filters to remove dust from combustion gases. The equipment for the plant was produced by Rumanian factories. The raw materials for the plant were to be produced in a nearby limestone and clay quarry. The area has extensive reserves of raw materials for cement production.

Mineral Fertilizers.—Sustained development of the chemical industry led to increased output of mineral fertilizers. The raw material base for production of mineral fertilizers was Rumania's large natural gas reserve and imported Soviet apatite. The completion of the Pietra-Neamt nitrogen fertilizer plant, the Craiova chemical combine and the Tirgu Mures fertilizer combine were expected to increase substantially the nitrogenous fertilizer production in the country. In addition to other chemicals, the Pietra-Neamt plant will produce 20,000 tons of urea. The Craiova plant will produce 300,000 tons of ammonium nitrate, 100,000 tons of urea and 50,000 tons of ammonia water. The plant at Tirgu Mures will produce 150,000 tons of ammonium nitrate and 50,000 tons of ammonia water.

Refractories.—Metallurgical development has led to extensive research in the field of refractory production. The Petrolul refractory plant in Turda and the Research Institute of the Building Ministry developed a process and mastered industrial techniques for producing diatomite insulating refractory bricks from domestic materials. The bricks were to be used for rotary-kiln insulation in cement plants. Initial monthly production was 20 tons of bricks.

MINERAL FUELS

With a production of over 12 million tons of crude oil, Rumania ranked second in Europe. Domestic production of low-grade solid mineral fuels (over 10.3 million tons), and large quantities of natural gas combined with a small part of total Rumanian oil production satisfied energy demands of the country, except for coking coals and coke that had to be imported.

Coal.—Lignite comprised around 60 percent of total Rumanian coal output. New deposits of lignite have been discovered in the sub-Carpathian zone of Oltenia in the Valea Motrului Valley with estimated reserves of 2,000 to 3,000 million tons. Several mines were planned for this area to provide lignite for the electric and steam plant in Craiova.

Coke.—An installation for production of petroleum coke was partially put into operation in the Onesti oil refinery. The annual capacity of the plant was to be about 50,000 tons of coke. The second petroleum coke plant in Rumania went on stream at the Brazy refinery in the spring of 1964. The plant had a capacity 60 percent larger than that of the Onesti refinery.

Petroleum and Natural Gas.—The small annual crude oil production increases of the past several years suggest that Rumania has almost reached its peak in petroleum production from shallow formations. Deep drilling up to 5,000 meters indicates that exploration efforts have been moved toward deep structures, and it appears that the future development of the petroleum industry depends mostly on how successful the deep drilling will be. It was expected that Rumania would try to maintain present production levels and keep petroleum product exports as the country's main source of foreign exchange. Drilling activities were conducted in an efficient way compared with Soviet achievements, but were still far behind results attained in Western Europe or even Yugoslavia. Most equipment used was made in Rumania, but Soviet turbodrills were used in 60 percent of the drilling.

Production was maintained mostly by development and expansion of existing fields rather than by new discoveries. Secondary methods and hydraulic fracturing were used to an increasing extent.

The petroleum processing industry met the planned targets, achieving increases by commissioning new facilities and by improving existing refineries. The new addition at the large refineries built in recent years in the Prahova Valley and Moldova made possible production of a large quantity of lubricants.

The Mineral Industry of Spain

By Stephen C. Brown[1]

⁂

IN 1964 Spain's mining industry continued its slow relative decline as a factor in the country's economy despite achieving a total output slightly above that of 1963. The mineral processing industries (iron and steel, nonferrous metallurgy, fertilizers, cement, and petroleum refining) on the other hand continued their vigorous growth.

The real output of the Spanish economy as a whole, after recording a 6 percent growth in 1963, is estimated to have increased by some 6.5 percent in 1964. Inflationary pressures began to be felt towards the end of the year, with prospects of further cost rises in the mineral industries. The real output of Spanish mines and quarries is estimated to have risen by less than 1 percent during the year, and by 1964 the contribution of the mining sector (mines and quarries) to total gross national product had declined to about 1.4 percent as compared with 2.2 percent in 1954. National income from mining in 1964 is estimated at about $250 million[2] as compared with an estimated total gross domestic product of about $17.7 billion.

Coal is estimated to have contributed about $150 million of the total mineral industry share of national income, metallic minerals about $60 million, and nonmetals (including ores and stone and earth products) about $40 million. The trend in mining employment has been downward; total employment in mines and quarries at the end of 1963 was 156,527, out of a total labor force of about 12 million. Total employment in the mineral industries, including the processing sector, may be estimated at about 300,000 to 350,000 at the beginning of 1964. Though mining output is relatively stagnant and the trend of mining employment downward, productivity in the mines is rising; it is estimated to have risen by 7 percent in 1964.

Reviewing the record of the mining industry in 1963, the Consejo de Minería y Metalúrgica noted that in general the industry's problems arose from the multiplicity of small, inadequately financed and equipped mining enterprises, and that aside from iron, mercury, lead, and zinc, the mining of most metals in Spain is economically marginal. Present reserves of lead and zinc were estimated as sufficient for domestic requirements for about 10 years, but Spain was said to be facing a shift from an export to an import basis in these metals in the next few years.[3]

---

[1] International economist, Division of International Activities.

[2] Where necessary, values have been converted from pesetas (Pts.) to U.S. dollars at the rate of Pts. 60 equals US$1.00.

[3] Consejo de Minería y Metalúrgica. Estadística Minera y Metalúrgica de España, Año 1963. P. x–xii.

The Spanish balance of trade in mineral commodities continued to deteriorate in 1964 despite a recovery from the depressed values of 1963 mineral exports, as mineral imports rose again by more than 15 percent in value after a rise of about 9 percent in 1963; the net deficit on mineral trade is reported to have grown by 24 percent to $294 million in 1964. This compares with a total deficit on visible trade of $1.3 billion. Mineral import value for several years has been more than four times as large as mineral export value, and the ratio has tended to grow. This is not surprising because Spain is in the midst of rather rapid economic development and industrialization with requirements for metals and minerals growing swiftly, necessitating increased imports and decreased availability of domestic mineral production for export markets.

Major developments in Spain's mineral industries during 1964, other than changes in production and trade, included the coming on stream of a 2-million-ton capacity petroleum refinery, the discovery of oil in small but commercial quantities, the licensing of three additional refineries, a serious strike in the Asturian coal mines, the discovery of large phosphate deposits in the Spanish Sahara which may provide ample raw materials for Spain's fertilizer industry, and the opening of the Spanish mining industry to foreign investment.

GOVERNMENT POLICIES AND PROGRAMS

The Government's 4-year economic development plan, covering the years 1964–67, was inaugurated in January 1964. It called for investments of $55 million in iron mining, $23 million in pyrites mining, $17 million in lead and zinc mining, $37 million in potash mining, and $148 million in coal mining over the 4-year period. Required investments in the iron and steel industry were estimated at $148 million and in the nonferrous metallurgical industries at about $150 million.

The plan projects seven main development areas (Coruna, Seville, Vallodolid, Vigo, Zaragoza, Burgos, and Huelva) in which investments in "industries of preferential interest" are granted certain benefits, including tax exemptions or reductions, preference in obtaining official credit, and in some cases, subsidies "chargeable against the corresponding items in the public investments programme." Mineral processing industries are eligible for this assistance in all seven areas.[4]

The plan is indicative only and does not in itself provide for financing the necessary investments for which reliance is placed on private enterprises, credit institutions, and foreign investors; but it should not be forgotten that the Spanish Government, through the Instituto Nacional de Industria (INI), plays an important role in the mining and mineral processing sectors of the economy. A summary of the plan published by the Comisaría del Plan de Desarrollo Económico points out that it is "binding for the public sector, which must adapt itself strictly to the Plan."[5]

At the end of the year the Government issued a decree allowing foreign investors to purchase up to a 50 percent interest in mining enterprises without government permission, and a higher percentage with special permission, thus placing mining investments on an equal footing with enterprises in other industrial sectors. Previously aliens had not been permitted to invest in mining as freely as in other sectors.

---

[4] Guide for Foreign Investors. Enclosure in Spanish Newsletter. V. 4, No. 6, June 30, 1965. Embassy of Spain, Washington, D.C., 8 pp.

[5] Summary of the Spanish Economic and Social Development Plan, 1964–1967. Madrid 1964. P. 21.

During the year also, several measures were taken to meet specific problems in several mineral industries. Following strikes in the coal mines that resulted in a 25 percent increase in wages, coal prices were permitted to rise only 2 percent, but the Government introduced a subsidy arrangement for mine owners and gave the coal industry preference in official credit. A "Concerted Action Plan for the Coal Industry" introduced in the spring of 1965 added a promise to assist owners in mine modernization. At various times during 1964, in order to meet coal shortages, customs duties were suspended on the importation of bituminous and anthracite coal.

Similarly, customs duties on lead and zinc imports were suspended to meet domestic supply shortages due to increasing demand and falling domestic production. The shortage of zinc was reported to be caused by the flooding of an important mine.

PRODUCTION

According to estimates of the Ministry of Industry, the real output of Spanish mines and quarries increased by 0.6 percent in 1964, but production of some important minerals failed to reach the goals set by the economic development plan and in a few cases declined from 1963 levels. Coal output declined by about 6 percent, though the 1964 strikes were less serious than those of 1963, and returned to approximately the 1962 level of production. Output of iron ore increased by about 2 percent. Mine and smelter production of lead and zinc declined, while output of copper (ores and concentrate, smelter and refined) increased substantially. Sharp rises occurred in the output of mercury and pyrites, two of Spain's principal mineral exports. Production of fluorspar and potassium salts also showed sharp increases, and, although no statistical data are available, it is probable that output of construction materials continued to rise.

The mineral processing sector of the mineral industries showed a better record, with output of aluminum metal, iron and steel (including ferroalloys), refined copper, cement, fertilizers, and elemental sulfur increasing sharply.

TABLE 1.—Spain: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964[p]
Metals:					
Aluminum:					
Bauxite	2,573	5,594	6,047	5,225	NA
Aluminum metal	28,740	37,648	41,688	[r] 45,488	61,772
Aluminum alloys	3,536	10,698	7,155	13,860	NA
Antimony:					
Content of ore mined	220	172	159	[r] 59	60
Smelter production	504	531	552	853	NA

See footnotes at end of table.

TABLE 1.—Spain: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Metals—Continued					
Arsenic:					
As_2O_3 content of concentrate	419	321	216	[r] 141	114
Smelter production (As_2O_3)	394	311	212	[r] 146	114
Bismuth:					
Content of concentrate produced..kilograms	15,000	9,436	2,308	[r] 4,000	----------
Smelter production..do	13,551	9,719	8,527	11,719	[e] 11,700
Cadmium..do	11,848	34,318	60,228	54,100	[e] 55,000
Copper:					
Ore and concentrate	8,176	9,585	7,894	[r] 7,525	7,892
Blister [1]	13,089	18,812	20,247	[r] 23,513	24,290
Refined (fire and electrolytic)	41,804	50,848	49,313	[r] 49,993	57,164
Copper sulfate	4,413	10,671	8,803	6,863	2,837
Gold:					
Content of ores mined for gold..troy ounces	13,986	8,231	6,687	[r] 15,625	23,824
Byproduct recovery..do	13,471	20,737	45,826	NA	NA
Total..do	27,457	28,968	52,513	NA	[2] 21,852
Iron and steel:					
Iron ore (iron content)..thousand tons	2,798	2,848	2,857	[r] 2,533	2,597
Pig iron..do	1,886	2,077	2,100	[r] 1,911	1,798
Ferroalloys:					
Ferromanganese	26,098	22,289	28,013	[r] 27,581	37,188
Ferrosilicon	14,933	22,541	25,169	[r] 28,044	19,237
Other	886	1,398	977	17,322	NA
Steel ingots..thousand tons	[r] 1,919	2,340	2,311	[r] 2,492	2,737
Steel shapes and plates..do	1,787	1,652	1,625	[r] 2,020	2,290
Other iron and steel products..do	NA	1,519	1,703	[r] 2,067	NA
Lead:					
Content of ore and concentrate	72,895	79,708	70,998	60,850	57,362
Smelter	71,181	77,726	72,272	[r] 62,084	55,064
Manganese ore	22,304	15,506	12,792	[r] 15,293	15,929
Mercury:					
Content of ore mined..76-pound flasks	55,902	20,217	52,446	55,617	78,815
Smelter production..do	53,369	51,202	52,794	56,954	75,073
Silver..thousand troy ounces	1,740	4,527	5,684	4,955	NA
Tin:					
Content of ore and concentrate..long tons	196	230	231	158	91
Smelter..do	464	731	905	[r] 1,288	2,176
Solder..do	462	639	577	610	NA
Titanium (TiO_2 content of ore and concentrate)	5,454	14,255	20,593	[r] 24,829	19,375
Tungsten (WO_3 content of ore and concentrate)	560	648	423	[r] 88	19
Uranium (U_3O_8)	----------	----------	----------	----------	[e] 64
Zinc:					
Content of ore and concentrate	86,110	87,982	78,521	[r] 91,733	89,357
Smelter production	44,965	52,494	62,579	[r] 64,730	63,037
Nonmetals:					
Asbestos	4	10	----------	----------	NA
Barite	25,942	33,973	38,939	48,364	NA
Calcite	1,485	440	----------	----------	NA
Cement, hydraulic:					
Natural..thousand tons	498	560	556	595	NA
Artificial..do	5,234	6,068	6,738	[r] 7,153	8,160
Chalk..cubic meters	44,428	54,307	35,401	92,227	NA
Clays:					
Bentonite	4,837	7,338	12,165	14,169	NA
Kaolin:					
Crude	112,364	126,893	167,793	207,609	NA
Content of pure kaolin, washed	43,122	50,995	67,879	78,542	NA
Others..thousand cubic meters	1,165	1,605	1,832	2,186	NA
Dolomite..cubic meters	88,059	94,104	91,278	118,791	NA
Feldspar	12,115	8,325	10,900	12,677	NA
Fluorspar:					
Acid grade	79,907	97,195	100,130	[r] 103,979	121,241
CaF_2 content	77,204	94,909	93,874	[r] 101,257	116,583
Metallurgical grade	31,112	49,727	49,878	[r] 49,421	25,147
CaF_2 content	23,826	35,916	35,530	[r] 31,983	16,514
Garnet	183	188	167	71	NA
Graphite	261	275	----------	----------	----------
Gravel..cubic meters	253,051	283,853	237,979	278,737	NA
Gypsum, alabaster, and anhydrite:					
Alabaster..do	5,539	7,213	8,767	----------	----------
Anhydrite..do	112,411	13,561	16,283	17,774	NA
Gypsum..thousand cubic meters	1,025	1,260	1,468	1,911	----------
Industrial earths not elsewhere specified	9,993	7,368	6,709	6,793	NA
Lime:					
Hydraulic	196,824	223,642	[r] 229,961	248,781	NA
Quicklime	114,339	145,523	183,737	212,395	NA
Limestone..thousand cubic meters	10,658	11,099	10,316	11,191	NA
Lithium minerals (amblygonite)	26	17	----------	----------	----------

See footnotes at end of table.

TABLE 1.—Spain: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Nonmetals—Continued					
Magnesite	48,298	83,191	71,387	84,654	NA
Marble ... cubic meters	37,022	40,921	35,392	51,523	NA
Marl ... thousand cubic meters	1,750	1,958	1,996	2,455	NA
Ochre	17,692	19,125	18,664	15,208	NA
Phosphate fertilizer (superphosphate)	316,699	297,895	329,294	[r] 326,400	326,338
Potassium salt, natural (sylvite), K_2O equivalent	264,314	262,210	235,103	260,250	292,614
Pumice	1,464	1,438	1,740	1,529	NA
Quartz	80,575	68,087	99,617	73,115	NA
Quartzite ... cubic meters	212,684	218,127	191,669	224,080	NA
Salt:					
Rock ... thousand tons	537	614	626	699	NA
From springs ... do	14	18	18	14	NA
Sea salt ... do	840	967	995	985	NA
Sand, industrial ... cubic meters	231,890	285,225	433,420	606,822	NA
Sandstone ... cubic meters	290,537	371,928	405,492	452,372	NA
Sepiolite, content of pure sepiolite	2,146	4,172	3,847	4,662	NA
Serpentine ... cubic meters	517	565	482	616	NA
Silica and silica sand	130,632	177,293	238,022	287,794	NA
Slate:					
Graphitic ... cubic meters	1,234	1,530	1,500	1,600	NA
Other ... do	44,762	68,066	60,519	100,276	NA
Sodium compounds, natural (Na_2SO_4 content):					
Glauberite (sodium-calcium sulfate)	1,501	1,254	1,928	2,517	NA
Thenardite (sodium sulfate)	17,135	18,079	20,700	33,465	NA
Stone, crushed and dimension [3] ... cubic meters	569,237	724,266	851,141	966,515	NA
Sulfur:					
Content of iron pyrites	917,113	777,161	799,012	778,719	901,497
Content of cupriferous iron pyrites	153,091	244,270	214,193	179,986	213,924
Elemental	[4] 40,839	[5] 49,098	[5] 42,507	[5] 27,961	[5] 35,550
Talc (steatite)	27,989	27,667	27,725	27,503	NA
Tripoli	12,555	17,550	12,113	10,187	NA
Tufa ... cubic meters	147,546	173,272	181,810	184,280	NA
Mineral fuels:					
Coal:					
Anthracite ... thousand tons	2,514	2,597	2,643	2,773	2,647
Bituminous ... do	11,269	11,199	10,052	10,170	9,461
Lignite ... do	1,762	2,089	2,488	2,591	2,575
Coke:					
High temperature ... do	2,574	2,609	2,738	2,752	2,559
Low temperature ... do	248	253	232	199	169
Natural asphalt	993	1,047	988	896	NA
Coal treated by coal distillation plants thousand tons	3,584	3,681	3,826	5,490	NA
Products of coal distillation:					
Liquid tar and pitches	121,514	131,784	204,376	120,895	NA
Other tar and pitch	34,703	26,652	28,567	28,707	NA
Oils, not otherwise specified	24,660	18,599	15,537	16,194	NA
Gas ... million cubic feet	NA	NA	32,267	31,772	NA
Bituminous shale treated by distillation plants	806,594	773,543	739,148	[r] 788,381	712,091
Products of bituminous shale distillation:					
Gas-oil	35,823	44,917	40,799	[r] 45,212	49,012
Lubricants	36,477	50,122	51,559	[r] 50,191	[6] 69,153
Nonlubricating oils and greases	2,034	3,696	5,499	[r] 5,091	NA
Paraffin	7,150	5,352	1,730	3,109	4,554
Dry gas	9,294	NA	NA	NA	NA
Crude oil treated by refineries ... thousand tons	6,275	7,028	8,615	9,695	NA
Petroleum refinery products:					
Dry gases ... do	134	164	255	[7] 328	78
Gasoline ... do	794	864	1,023	[r] 731	1,258
Jet fuel ... do	65	81	180	[r] 196	156
Kerosine ... do	342	321	343	[r] 351	404
Gas oil ... do	1,043	1,412	1,691	[r] 1,963	2,446
Diesel oil ... do	307	301	342	254	284
Residual fuel oil ... do	3,143	3,388	4,105	[r] 4,772	5,552
Lubricants ... do	36	47	49	[r] 105	130
Asphalt ... do	158	185	249	264	331
Other ... do	20	19	19	[r] 126	653

[p] Preliminary. [e] Estimate. [r] Revised. NA Not available.

[1] Including production from imported ore and concentrate.

[2] Metal production.

[3] Includes basalt, diabase, fonolite, granite, ophite, porphyry, and trachyte.

[4] Including 16,959 tons from domestic ore.

[5] Refined and sublimated. There has been no production from domestic ore since 1960.

[6] Including nonlubricating oils.

[7] Including liquefied petroleum gases.

TRADE

In both 1963 and 1964 mineral imports accounted for about 27 percent by value of total imports, while mineral exports accounted for 16 percent by value of total exports in 1963 and about 14.5 percent in 1964.

Exports of minerals and mineral products declined in value about 7 percent in 1963 but regained this loss in 1964, rising about 14 percent in value above 1963 levels. Exports of mercury increased by 83 percent in value in 1964, of pyrites 14 percent, of fertilizers (chiefly potash) by 46 percent, of iron and steel about 53 percent, and of fluorspar by 61 percent. Exports of the five principal nonferrous metals increased by 33 percent in value in 1964; the chief increase in this category was in copper (mainly refined copper) and zinc.

Spanish imports of minerals and mineral products increased in value by 9 percent in 1963 and by nearly 16 percent in 1964. Crude petroleum and refined petroleum products accounted for slightly more than 40 percent of the total value of mineral imports in both years, while imports of iron and steel (including ores, ferroalloys and semifinished products) declined slightly, as a proportion of the total, from about 25 percent of the total in 1963 to about 22.5 percent in 1964. Imports of nonferrous metals (aluminum, copper, lead, zinc, and tin) and their ores and concentrates increased in value by 37 percent in 1964 and amounted to 13 percent of total mineral imports.

Imports of cement doubled in value in 1963 and increased by a further 21 percent in 1964, accounting for 3.5 percent, by value, of total mineral imports in the latter year. Imports of fertilizers and fertilizer raw materials, however, declined in value both absolutely and as a percentage of total mineral imports in 1964, declining by about 28 percent in value and falling from about 9 percent to about 5.5 percent of the total value of mineral imports.

TABLE 2.—Spain: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1963
Metals:				
Aluminum:				
Unwrought and scrap	10,720	10,751	9,147	Poland 3,500; Rumania 2,525; Bulgaria 2,252; Italy 1084.
Semimanufactures	3,561	5,039	2,637	Bulgaria 2,025: United States 1,195; Portugal 190.
Copper, all forms	[1] 122	617	6,586	United Kingdom 394; Cuba 166; Colombia 35; United States 10.
Gold, semimanufactures troy ounces	(2)	----------	----------	
Ilmenite	24,636	20,760	26,722	Italy 10,660; France 6,900; Belgium 3,200.
Iron and steel:				
Iron ore..thousand tons	1,188	1,295	1,650	West Germany 463: United Kingdom 280; Netherlands 278.
Roasted pyrites and sinter.	777,356	696,440	803,081	West Germany 445,927; United Kingdom 143,476; Netherlands 76,521.
Scrap	132	3,703	3,538	Italy 3,603; West Germany 100.
Pig iron and castings	144,613	112,592	147,926	Poland 61,052; United States 27,605; West Germany 18,231.

See footnotes at end of table.

TABLE 2.—Spain: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1963
Metals—Continued				
Iron and steel—Continued				
Ferroalloys:				
Ferrosilicon	9,856	10,013	8,014	West Germany 4,448; United Kingdom 4,255: United States 800: Czechoslovakia 500.
Other	5,792	9,973	9,835	United States 6,200: West Germany 3,075; United Kingdom 540.
Steel:				
Ingots and equivalent primary forms.	[3] 63,424	50,292	50,481	United Kingdom 16,395; United States 10,406; Turkey 9,632; Bulgaria 8,400.
Semimanufactures	8,644	52,617	43,276	Italy 45,482.
Lead:				
Ore and concentrate	542	20	------------	All to France.
Metal and alloys, unwrought.	29,233	11,628	1,908	Italy 2,358; France 2,270; United States 2,000; United Kingdom 1,800.
Semimanufactures	154	44	32	Andorra 26; West Germany 8; Morocco 5; Dominican Republic 4.
Manganese, ore and concentrate.	6,728	------------	20	
Mercury ---- 76-pound flasks	45,891	49,126	70,747	United States 15.508; Israel 5,660; Portugal 5,564; France 5.479.
Slag, ash, and residues containing metal.	NA	5,063	[6] 40,948	West Germany 4,356; Netherlands 647; Andorra 29.
Zinc:				
Ore and concentrate	29,590	32,694	24,308	France 9,137; Switzer!and 8,045; Netherlands 5,817; Belgium 5,805.
Unwrought and scrap	23,846	23,813	19,425	West Germany 7,332; United States 5,404; United Kingdom 3,874; Portugal 2.532.
Semimanufacturers	132	28	69	United States 10; Andorra 6.
Other metallic ore minerals [4]	296	78	176	Canada 20; West Germany 16; Sweden 15; United Kingdom 12; India 5.
Other metals [5]	217	21	566	West Germany 10; United States 5; United Kingdom 3.
Nonmetals:				
Barite	40,095	28,922	56,877	United States 14,890: Italy 7,330; France 3,747: United Kingdom 2,520.
Cement, hydraulic	10,900	10,135	9,369	Andorra 9,843; Gibraltar 141.
Clays:				
Kaolin	9,265	10,715	18,732	West Germany 6,456; Netherlands 1,800; Italy 1,253: Belgium 1,000.
Bentonite	2,434	2,221	5,625	France 1,767; West Germany 390; Egypt 25.
Other	7,290	15,187	11,407	Italy 9,399; France 3,779: West Germany 420; Denmark 197.
Diamond				
value, thousand pesetas	503	47	------------	All to Guatemala.
Diatomite and other siliceous earths.	365	480	531	United Kingdom 280; West Germany 180; Venezuela 20.
Dolomite	6,483	4,457	624	France 4,440; Portugal 17.
Feldspar, lucite, nepheline, and nepheline-syenite.	600	------------	------------	
Fertilizers and fertilizer raw materials:				
Nitrogenous: Ammonium sulfate.	3,170	1,500	1,500	All to Equatorial Customs Union (Africa).
Phosphatic:				
Thomas slag	71,482	------------	17,604	
Superphosphates		32,861	125,801	Egypt 27,495; Cyprus 2,250.
Other phosphatic fertilizers.		990	3,150	Mainly to Senegal.
Potassic:				
Potassium chloride	228,725	257,640	310,047	Norway 67,026; United Kingdom 49,484; United States 35,497; Belgium 26.095.
Potassium sulfate	19,360	12,454	12,205	United States 8,000: Portugal 2.700; Morocco 1,160; Greece 594.
Flint	1,367	13,044	7,998	Gibraltar 12,805; Andorra 136; Liberia 83.
Fluorspar	88,001	86,605	137,317	United States 62,498; West Germany 12,185; Italy 10,558.

See footnotes at end of table.

TABLE 2.—Spain: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1963
Nonmetals—Continued				
Gypsum	4,769	4,728	4,504	Andorra 3,133; Sweden 851; Gibraltar 393; France 246.
Lime, hydraulic	486	487	471	Andorra 428; Gibraltar 59.
Magnesite, natural	7,857	17,853	29,079	West Germany 15,617; Netherlands 2,170; Japan 55.
Natural pigments	199	233	42	France 120; Turkey 52; Belgium 30; Netherlands 20.
Pyrites ......thousand tons	1,022	1,031	1,218	West Germany 645; France 184; Denmark 83; Belgium 37.
Quartz and quartzite	NA	9	13,454	Italy 8; Portugal 1.
Salt	511,281	465,328	334,437	Japan 80,631; United States 75,814; Italy 61,380; Denmark 40,714; Canada 38,903.
Sand	63,786	69,139	63,609	Andorra 37,634; Gibraltar 31,293; Portugal 200.
Shale	495	459	1,497	Andorra 253; France 196; Colombia 10.
Stone; dimension:				
Calcareous	11,956	12,927	12,479	Italy 5,834; West Germany 2,635; France 2,400.
Other	10,030	3,916	5,190	France 2,353; Italy 907; West Germany 515.
Talc and steatite	212	3	233	Mainly to Argentina.
Others [7]	74	1,305	1,696	NA.
Mineral fuels:				
Carbon black	9	------------	------------	
Coal, bituminous and lignite	15,599	8,633	2,325	Belgium 6,020; Andorra 1,665.
Coke and coke briquets	------------	14,914	54,078	All to Italy.
Petroleum:				
Crude, topped	NA	50,307	33,548	All to Netherlands.
Petroleum refinery products:				
Gasoline	54,752	255,363	250,288	United Kingdom 95,453; Nigeria 28,143; Ivory Coast 27,214; France 15,505.
Aviation gas and jet fuel.	49,110	10,181	168	Chiefly bunkers; Morocco 322.
Kerosine	111,734	69,616	125,015	Nigeria 16,630; United Kingdom 15,180; Portugal 11,128; Senegal 6,984.
Residual fuel oils	21,011	1,132,120	1,051,372	Bunkers 348,358; United Kingdom 86,930; Belgium 80,787; Nigeria 57,516.
Gas diesel oil	384,886	407,523	273,786	Bunkers 218 505; Netherlands 55,872; United Kingdom 25,433; Nigeria 25,160.
Lubricants	26	984	580	Bunkers 942.
Liquefied petroleum gases. ....cubic meters	5,940	7,411	12,012	Mainly to Brazil.
Paraffin	768	373	10	France 148; Italy 100; United Kingdom 100.
Other	44	47,949	119,548	Portugal 12,457; Cyprus 8,127 Portuguese Africa 6,513; Ceylon 6,491.

NA Not available.

[1] Includes 72 tons of matte exported to Belgium.

[2] Less than ½ kilogram.

[3] Includes 37 tons of coils for rerolling.

[4] Includes bauxite, tin, tungsten, titanium, vanadium, molybdenum, tantalum, zirconium, and unspecified.

[5] Includes antimony, columbium, cadmium, tantalum, selenium and tellurium, tin, tungsten, and unspecified.

[6] Including 34,841 tons containing zinc.

[7] Including asbestos, meerschaum, sulfur, chalk, abrasives, mica, natural borates, and unspecified.

TABLE 3.—Spain: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Metals:				
Aluminum:				
Bauxite	46,828	65,706	53,124	Greece 50,125; Surinam 11,409; British Guiana 3,830.
Alumina and aluminum hydroxide.	91,117	91,985	101,138	France 89,712; United States 2,031.
Aluminum scrap	981	322	166	United Kingdom 118; United States 88; Rhodesia-Nyasaland 37.
Metal and alloys:				
Unwrought	7,459	10,329	9,984	Canada 9,434.
Semimanufactures	1,880	5,969	6,527	Canada 2,630; France 973; West Germany 805; Switzerland 442.
Antimony:				
Ore and concentrate	589	516	539	Morocco 391; mainland China 80; France 44.
Metal, unwrought	61	135	155	Netherlands 95; United Kingdom 20; West Germany 10; France 10.
Arsenic, white	663	1,200	1,472	France 977; Portugal 210; United Kingdom 3.
Bismuth, all forms	17	8	21	Mainly from United Kingdom.
Cadmium, all forms	21	11	17	West Germany 4; Netherlands 3; Belgium 2; France 1.
Chromium:				
Chromite	19,658	15,128	18,290	South Africa 8,058; Iran 6,013; Turkey 1,032.
Metal, unwrought	6	1	6	France 0.5; United Kingdom 0.110; West Germany 0.104.
Copper:				
Ore and concentrate	22,909	17,885	19,883	Cyprus 11,981; Italy 3,659; Chile 1,997.
Matte	3,204	4,963	12,857	Israel 3,580; Chile 1,300; France 55.
Metal:				
Blister	18,846	12,309	20,380	Turkey 8,433; Uganda 1,566; Rhodesia-Nyasaland 965.
Refined, unwrought	4,914	11,607	8,748	Belgium 4,437; West Germany 2,270; Rhodesia-Nyasaland 1,980; Congo (Léopoldville) 1,225.
Copper and alloy semimanufactures.	3,870	9,902	10,123	United Kingdom 2,983; West Germany 1,600; Belgium 1,383; France 1,137.
Scrap	[r] 15,834	10,403	10,201	West Germany 1,908; Canada 1,830; France 1,731; United States 1,236.
Gold, semimanufactures. troy ounces	26,685	4,147	4,565	Mainly from West Germany.
Iron and steel:				
Iron ore	252,860	93,173	94,312	Morocco 76,575; Brazil 10,020; Mauritania 6,375.
Scrap	[r] 306,754	202,100	308,629	United Kingdom 145,427; United States 36,313; Portugal 5,173; France 4,713.
Pig iron and castings	3,729	3,255	1,830	West Germany 1,512; Norway 1,298.
Shot, grit, pellets, powder, sponge.	853	1,178	1,583	Sweden 838; France 209; West Germany 73.
Ferroalloys:				
Ferrochromium	1,683	1,903	2,177	France 514; Norway 454; Sweden 265; Italy 166; Netherlands 101.
Ferromanganese	1,419	1,507	1,636	Norway 998; France 367; Italy 75.
Ferrosilicon	159	1,604	1,396	Norway 308; United Kingdom 135; West Germany 110.
Ferrotungsten	41	49	12	Sweden 42; France 6; Austria 1.
Other	871	968	1,751	France 371; Norway 198; West Germany 132.

See footnotes at end of table.

TABLE 3.—Spain: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Metals—Continued				
Iron and steel—Continued				
Steel:				
Ingots and other primary forms.	[r]175,316	204,460	279,329	Italy 55,216; West Germany 31,541; France 13,411; Venezuela 9,640; Belgium 7,786.
Semimanufactures:				
Coils for rerolling	130,924	224,987	238,072	Japan 116,697; Netherlands 47,142; West Germany 27,765; United Kingdom 15,897.
Wire rod	27,523	15,822	13,539	West Germany 8,566; France 4,863; Belgium 1,514.
Bars and rods	25,922	40,389	31,379	West Germany 16,448; Belgium 13,530; France 5,227; United Kingdom 2,884.
Angles, shapes, sections.	[r]24,669	24,505	30,977	United Kingdom 9,879; West Germany 6,315; France 4,967; Belgium 2,277.
Plates and sheets:				
Uncoated	70,625	188,892	248,101	United Kingdom 37,748; France 36.429; Belgium 29,989; Austria 24,759; Italy 24,626.
Coated	73,981	92,460	85,131	United Kingdom 33,907; France 20,570; West Germany 13,012; United States 7,052.
Hoops and strips	10,002	5,875	9,157	West Germany 1,452; France 987; Italy 469; Sweden 450; United Kingdom 411.
Railway track material.	6,996	8,390	2,793	United Kingdom 5,248; West Germany 2,450.
Tubes, pipes and fittings.	10,820	42,618	25,308	France 14,510; West Germany 12,443; United Kingdom 7,106.
Castings and forgings.	63	67	------------	All from West Germany.
Lead, all forms	34	44	1,709	United States 16; West Germany 13; United Kingdom 9.
Magnesium, all forms	242	172	221	United States 142; Norway 10; Canada 10.
Manganese:				
Ore and concentrate	61,737	102,370	149,668	Ghana 32,975; Ivory Coast 31,662; India 14,858; Morocco 7,637.
Metal, unwrought	86	82	61	South Africa 57; Japan 15; West Germany 4; United Kingdom 3.
Molybdenum, semimanufactures.	3	4	13	Netherlands 2; West Germany 1.
Nickel:				
Ore and concentrate	NA	217	477	Australia 205; United Kingdom 12.
Matte, speiss, etc	380	1,006	1,027	United Kingdom 446; Canada 256; France 159.
Unwrought, including scrap.	791	395	266	United Kingdom 348; United States 33.
Semimanufactures, including anodes.	572	777	709	United Kingdom 239; France 222; West Germany 156; Netherlands 50.
Platinum-group metals, unwrought and semimanufactures. troy ounces	4,083	8,745	14,322	France 6,044; Switzerland 1,350.
Selenium and tellurium, all forms.	6	4	7	West Germany 2; Canada 1.
Silver, unwrought and wrought. thousand troy ounces	2,464	3,777	3,261	NA.
Silicon	NA	878	342	France 546; Italy 150; Norway 108.
Tin:				
Ore and concentrate. long tons	1,041	2,779	3,167	Thailand 1,231; Bolivia 561; Congo (Léopoldville) 513.
Unwrought do	27	84	29	United Kingdom 55; Malaysia 15.
Scrap do	10	(1)	------------	
Semimanufactures do	1	37	28	United Kingdom 18; Netherlands 12; Belgium 5.
Titanium, vanadium, molybdenum, tantalum and zirconium ores, not further subdivided.	[r]1,323	6,319	9,212	Portugal 2,300; Australia 1,901; Ceylon 1,200; United Kingdom 856.

See footnotes at end of table.

TABLE 3.—Spain: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Metals—Continued				
Tungsten:				
Ore	r 209	290	122	South Korea 92; Congo (Léopoldville) 38; Portugal 30.
Wrought and unwrought	7	7	8	West Germany 3; Sweden 3; Netherlands 1.
Zinc:				
Ore and concentrate	2,208	1,656	11,381	Italy 1,273; Portugal 383.
Metal and alloys, all forms.	58	31	40	Belgium 11; West Germany 5; Denmark 5; United Kingdom 4.
Other base metals [2]	86	144	119	Belgium 72; West Germany 33; Congo (Léopoldville) 30; France 2.
Nonmetals:				
Abrasives, natural, including pumice, emery and other.	1,242	628	1,156	Greece 533; Italy 42; Denmark 20.
Asbestos	27,852	40,137	51,509	Canada 17,040; South Africa 13,328; Rhodesia-Nyasaland 8,066.
Barium, sulfate, and carbonate.	4	906	98	France 810; West Germany 75; Norway 20.
Borates, natural	8,806	6,751	11,050	United States 4,701; Turkey 2,050.
Cement, hydraulic	r 689,939	1,334,238	1,534,045	Poland 250,441; Rumania 220,371; Portugal 153,266; Bulgaria 137,411.
Chalk, including ground chalk.	2,376	1,697	852	France 1,341; Belgium 290; United Kingdom 50.
Clays:				
Kaolin	7,358	7,955	16,033	United Kingdom 7,434; France 225; United States 184.
Bentonite	4,111	6,962	9,001	Morocco 5,914; France 534; United Kingdom 362.
Other	3,084	11,252	14,234	United Kingdom 5,240; France 2,948; Belgium 1,040.
Cryolite and chiolite, natural.	611	250	425	Denmark 240; France 10.
Diatomite and other siliceous earths.	r 1,537	1,723	2,048	United States 945; France 316; West Germany 245.
Diamond:				
Industrial. value 1,000 pesetas [3]	19,554	11,279	20,779	Ireland 3,299; United Kingdom 3,188; Netherlands 2,096.
Other than industrial.[3] do	53,046	18,224	55,561	Belgium 16,817; France 582; Switzerland 367.
Dolomite	1,242	2,124	2,003	France 1,515.
Fertilizer and fertilizer raw materials:				
Nitrogenous:				
Sodium, nitrates, natural.	135,762	112,182	125,142	All from Chile.
Sodium nitrates, synthetic.	NA	9,635	3,831	West Germany 6,035; Chile 3,066
Calcium nitrate	134,132	129,018	145,419	Norway 67,201; West Germany 35,616; Italy 12,677.
Ammonium nitrate	30,135	33,697	6,791	Italy 19,610; Bulgaria 7,197; France 4,449.
Ammonium sulfate	563,727	410,756	450,136	Italy 129,529; West Germany 115,779; United Kingdom 28,883; East Germany 27,761.
Sulfo-nitrate of ammonia.	101,321	101,800	77,311	West Germany 79,208; Italy 16,340; Belgium 5,665.
Calcium cyanamid	NA	200	------------	All from Italy.
Urea	NA	2,868	3,181	Italy 1,619; Netherlands 715; West Germany 453.
Mixed fertilizers	NA	20,065	32,162	France 19,635; Italy 200; Portugal 200.
Other nitrogenous	NA	6,353	2,335	Portugal 3,294; West Germany 1,254; France 1,253.
Phosphatic:				
Phosphate rock	1,026,249	1,018,428	1,101,465	Morocco 703,007; Algeria 157,273; United States 66,515.
Other natural phosphates.	NA	1,350	1,582	France 1,150; Senegal 150; West Germany 51.
Thomas slag	30,125	42,125	20,538	Belgium 27,474; France 14,561; West Germany 90.
Superphosphates	NA	548	100	All from Italy.
Other phosphatic fertilizers.	NA	------------	60	

See footnotes at end of table.

TABLE 3.—Spain: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Nonmetals—Continued				
Fertilizer and, etc.—Con.				
Potassic:				
Potassium salts	NA	------------	50	
Potassium sulfate	NA	1,025	572	West Germany 425; Netherlands 249; Belgium 200.
Magnesium and potassium sulfate.	NA	124	------------	Portugal 119; West Germany 5.
Mixed potassium fertilizer.	NA	1	------------	All from Italy.
Other fertilizers	NA	26,586	68,522	West Germany 11,987; Italy 10,895.
Flint	159	1,887	1,865	France 691; Italy 574; Denmark 500.
Graphite, natural	482	687	809	Madagascar 275; France 181; West Germany 167.
Magnesite, natural	3,241	1,160	3,921	United Kingdom 575; Netherlands 148; Austria 103; Brazil 100.
Mica, including splittings and waste.	r 362	587	437	India 275; Norway 88; United Kingdom 52; South Africa 51.
Pigments, natural	135	54	79	West Germany 33; France 20.
Sand	r 49,208	62,617	54,634	Belgium 44,695; Morocco 7,373; Netherlands 3,026.
Stone, dimension	1,606	10,247	6,046	Morocco 6,606; Italy 1,685; Greece 830; Belgium 577.
Sulfur	r 12,591	25,271	38,311	France 15,967; United States 9,294.
Talc and steatite	409	1,317	871	France 437; Norway 394; Rhodesia-Nyasaland 385.
Other [4]	3,651	5,579	5,670	Italy 3,840; Portugal 1,290.
Mineral fuels:				
Coal, bituminous and anthracite. thousand tons	r 1,545	1,791	1,850	United States 1,331; United Kingdom 291; West Germany 109.
Coke and coke briquets	305,985	127,733	101,428	West Germany 91,899; United Kingdom 25,209; Italy 9,294.
Coal tar and mineral tar	r 9,662	17,871	37,715	United Kingdom 17,609; France 258.
Petroleum:				
Crude, including shale oil. thousand tons	r 9,678	10,519	12,619	Saudi Arabia 3,161; Iraq 2,275; Iran 2,193; Venezuela 2,088.
Refinery products:				
Partly topped including topped crudes.	------------	110	20	United States 83; United Kingdom 26.
Gasoline	84,498	51,927	57,620	Surinam 24,227; United Kingdom 23,223; Netherlands 1,768.
Kerosine	29,211	9,221	17,153	United Kingdom 6,768; France 2,453.
Jet fuel	19,124	50,784	68,776	United Kingdom 43,462; France 7,321.
Gas/diesel oil	46,079	170,358	74,129	Surinam 43,018; Italy 30,092; Saudi Arabia 22,676; Rumania 20,976.
Residual fuel oil	9,358	332,557	74,175	Surinam 79,056; Venezuela 48,210; Aden 47,911; Italy 42,777; Egypt 28,877.
Lubricants	45,994	16,972	49,689	United States 7,551; United Kingdom 4,024; Netherlands 3,303.
Liquefied petroleum gases. cubic meters	2,000	4,141	21,839	Mainly from France.
Petroleum coke	21,379	14,583	26,934	United States 8,991; West Germany 5,567; France 25.
Other	2,697	4,260	23,016	United States 1,758; West Germany 1,133; Netherlands 523; France 501.
Carbon black	13,266	15,491	17,017	France 8,419; United States 2,024; Netherlands 1,997; West Germany 1,403.
Natural bitumens and asphalts.	328	614	582	United States 336; United Kingdom 253; Netherlands 6.

r Revised. NA Not available.

[1] Less than ½ unit.

[2] Includes tantalum, uranium and thorium, vanadium, niobium, zirconium, and unspecified.

[3] 60 pesetas=$1.00.

[4] Includes salt, pyrites, quartz and quartzite, lime, meerschaum, feldspar, gypsum, leucite, nepheline and nepheline syenite, shale, and unspecified.

COMMODITY REVIEW

METALS

Aluminum.—Spanish aluminum production increased by 35 percent in 1964, output of metal rising to 61,772 metric tons. The industry relied chiefly on bauxite from Greece and alumina from France as raw materials. The principal producer (with over 60 percent of total capacity) was Empresa Nacional del Aluminio, S.A. (ENDASA), a subsidiary of the Government holding company Instituto Nacional de Industria (INI), operating plants at Aviles and Vallodolid. The second largest producer was Aluminio de Galicia, S.A., an affiliate of Kaiser Aluminum and Chemical Corp., with a plant at La Coruña. A third company, Aluminio Español S.A., operated a plant at Sabinanigo.[6] Imports of metal and alloys, scrap, and semimanufactures totaled 16,677 tons in 1964, while exports of these categories totaled 11,784 tons. The 4-year development plans calls for a capacity of 70,000 tons by 1966, and both ENDASA and Aluminio de Galicia are reported to have plans for expansion.

Copper.—Production of both blister and refined copper increased in 1964, the latter sharply by 14 percent. Production of ore and concentrate also increased but only to the level of 1962 output, after the decline in 1963. Spain was again a net importer of copper, with substantial increases over 1963 levels in imports of ore and concentrate, matte and blister; only refined imports dropped sharply.

Iron Ore.—Production of iron ore increased by 2 percent in 1964 but remained 9 percent below the level of 1962 output. Exports rose by 27 percent (by 23 percent, if roasted pyrites and sinter are included), while imports (chiefly from Morocco) rose by 1.2 percent, slightly exceeding 1963 imports. The Government's Concerted Action Plan for Iron and Steel called for further increases in iron ore output, and investments of $55 million in iron mining were called for in the period through 1967. The Consejo de Minería y Metalúrgica, in its annual report for 1963, commented that with the exception of a few large enterprises, most iron mines are small, inadequately financed and equipped, and unable to install the necessary equipment for beneficiation of ores.

Iron and Steel.—Pig iron production decreased in 1964, but output of crude steel, ferroalloys, and semimanufactures recorded substantial increases. Output of crude steel reached a new high of 2,737,000 metric tons. Under the Government's Concerted Action Plan for the industry, published in August 1964, crude steel capacity was to be raised to 5.3 million tons in 1967 and 7.7 million tons in 1972; these figures were increased to 5.8 million and 8.5 million tons, respectively, in December 1964. Under the plan, the steel industries are to be grouped on three levels: The integrated firms (Altos Hornos de Vizcaya, S.A., Empresa Nacional Siderurgica S.A., and Union Siderurgica, S.A.), the nonintegrated firms (chiefly medium and small steelworks), and specialty steel producers. Firms adhering to the plan will receive government credits up to 70 percent of the cost of new installations, as well as the benefits of accelerated amortization and certain tariff and tax exemptions.

---

[6] Aluminium, v. 41, No. 4. April 1965, pp. 270–271.

Despite the increase in Spanish steel production, there was a substantial increase in imports of crude and semifinished steel, including a 36 percent increase in imports of ingots and equivalent primary forms. Exports of semimanufactures declined substantially from 1963 levels, though exports of pig iron and casting rose sharply and exports of crude steel were unchanged.

Empresa Nacional Siderurgica S.A. (ENSIDESA) was alloted 1.5 billion pesetas (about $25 million) from the 1964 budget of Instituto Nacional de Industria (INI) to complete projects begun in its first phase of expansion and to initiate construction for its second phase. In 1964 it put into service a new Siemens plant as well as a 500,000-ton-per-year oxygen steel plant at Aviles, for which it ordered a third 65-ton converter from West Germany.[7] Two such converters were in operation in 1964. The capacity of this oxygen steel plant is to be increased to 1 million tons per year in ENSIDESA's second stage of expansion. At the end of 1964 the Export-Import Bank extended a loan of $14 million to the firm to finance equipment for a slabbing mill and other facilities.

Altos Hornos de Vizcaya S.A., Spain's principal privately owned steel producer, obtained from the Export-Import Bank a loan of $2.1 million to finance acquisition of a 36,000-ton-per-annum galvanizing line. A hot strip mill, also financed by the Export-Import Bank, is expected to come into operation in 1966. The United States Steel Corp. which had been providing technical assistance to Altos Hornos for several years, signed an agreement with Altos Hornos in December 1964 providing for the supply of technical assistance, a $7.5 million credit to the company, and a 25 percent equity participation for U.S. Steel in the firm. In early 1965 Altos Hornos obtained a Spanish Government credit of about $72 million to be made available over a period of 3 years to be used in expanding the firm's capacity.

Three smaller Spanish steelworks (Industrias del Besos S.A. of Barcelona; Hierros Madrid S.A. of Madrid; and Rico y Echeverria S.A. of Zaragoza) reportedly acquired from West Germany a many-strand continuous casting machine for billets, while a fourth small producer (Duro Felguera S.A., La Felguera) acquired a single-strand installation of the same kind.[8]

Lead and Zinc.—In its annual review for 1963, the Cosejo de Minería y Metalúrgica estimated total metal content of lead and zinc of proved ("visible") ore reserves as follows:

Ore grade	Metal content (metric tons)	
	Lead	Zinc
High grade	519,800	528,500
Ore exploitable at prices yielding $196 per ton of contained metal	248,900	127,600
Low grade	150,000	200,000
Total	918,700	856,100

---

[7] Stahlund Eisen. 84th year, No. 4, Feb. 25, 1964, p. 1W1048.

[8] Stahlund Eisen. 84th year, No. 22, Oct. 22, 1964, p. 1W1009.

Comparing these reserves with the annual rate of consumption, the agency concluded that with regard to lead supplies, Spain's position was somewhat better than the European average, while with zinc supplies, it was considerably better off than the European average position.

Lead production in 1964, both mine and smelter, declined substantially from 1963 levels of output, continuing the downward trend of output that has prevailed since 1961. Exports declined precipitously to less than 2,000 tons, and imports rose sharply to 1,709 tons.

Stolburger Zink A.G. für Bergbau und Hüttenbetriebe of Aachen, West Germany, which had provided technical assistance to the Los Guindos lead mines (producers of concentrate, metal, and semimanufactures) for 4 years, reportedly took a 25 percent equity participation in the Los Guindos enterprise together with the Hochschild group of South America. Los Guindos reportedly was to increase its capitalization from 61.5 million to 82 million pesetas.[9]

Zinc production in 1964 (both mine and smelter) declined slightly from 1963 levels of output but remained above the levels of 1962. Exports of ore and concentrate and of metal declined somewhat more markedly; namely, by 26 percent and 18 percent, respectively. Imports of ore and concentrate rose sharply from 1,656 tons to 11,381 tons in 1964, but imports of zinc metal remained negligible. As in the case of lead, the Consejo de Minería y Metalúrgica concluded that Spain will be on an import basis for zinc within a few years.

A collapse of a main gallery in Spain's most important zinc mine at Reocin, requiring several months to repair, is expected to reduce 1965 production of ore. The mine reportedly has been producing about 50 percent of Spain's total ore output. The gallery collapsed in January 1965.

Mercury.—Output of mercury, stimulated by high demand and rising prices, rose sharply to more than 75,000 flasks in 1964. A program of expansion and modernization at the Almaden mines was planned to increase output to 100,000 flasks per annum.[10]

NONMETALS

Cement.—Complete data for Spanish cement production in 1964 are not available, but production figures for artificial (i.e., manufactured, as opposed to natural cement or pozzolan) indicate an increase of over 15 percent above 1963 levels. This increase, however, was apparently insufficient to meet the requirements of the Spanish construction boom, and imports increased by 15 percent to 1,534,045 metric tons. Cement exports continued their downward trend in 1964. The Spanish cement industry is one of those which has met the production goals of the 4-year plan but has evidently still been unable to keep up with domestic demand. In early December 1964 the Government warned the industry of the need for additional capacity in west central Spain and threatened to establish a government-owned firm to meet requirements if acceptable proposals were not received within 6 months.

---

[9] Metall. V. 19, No. 1, January 1965, p. 94.
[10] Mining Annual Review 1965. Mining Journal (London), p. 281.

Fertilizers.—The rapidly growing Spanish fertilizer industry has generally met the production goals of the 4-year plan. The most rapidly growing sector of it has been the manufacture of nitrogenous fertilizers, output of which rose by 28 percent (in terms of nitrogen content) in 1964. Production of phosphatic fertilizers was about the same as in 1963 and failed to meet plan goals; production of potash fertilizers, however, increased and met goals. Output of potassium salts, the principal crude fertilizer material produced in Spain, increased by about 35 percent to 337,469 tons (K_2O equivalent).

Actual domestic consumption of nitrogenous fertilizers in 1964 was estimated at 1,791,000 metric tons; consumption of potash fertilizers did not rise as rapidly as production, and consumption of phosphatic fertilizers actually decreased. Imports of nitrogenous fertilizers rose by a little over 20,000 tons, the chief increases occurring in imports of natural nitrates, calcium nitrate, and mixed fertilizers. Imports of phosphatic fertilizers (chiefly phosphate rock) were practically unchanged. Imports of potassic fertilizers were, as usual, negligible.

A major new fertilizer plant, the Amoniaco Español S.A. plant at Malaga, came on stream in 1964. The facility, in which Esso holds a 75 percent interest, reportedly has an annual capacity of 100,000 metric tons (nitrogen content), equivalent to an output of 300,000 tons of fertilizers. Other fertilizer enterprises were reported to have plans for expansion of their existing plants. At the end of the year the Ministry of Industry was reported to have declared a 3-year moratorium on the installation of new fertilizer plants, believing that present and planned capacity would be capable of meeting domestic demand during that period. New plants planned or under construction in 1964 included one by Empresa Nacional Siderurgica S.A. at Aviles; three by Fertilizantes de Iberia S.A. (La Coruña, Huelva, and Castellon); one by S.A. Cros, Energia y Industrias Aragonesas S.A. and Catalona de Gas y Electricidad S.A. near Barcelona; and one by S.A. Abonos Azamon (in which Imperial Chemicals holds a 49 percent interest) at Tarragona.[11]

A major development in the fertilizer industry was the discovery, in 1964, of large deposits of phosphates in Spanish Sahara. Since supplies of phosphate rock for the Spanish superphosphate industry must be imported, the availability of raw materials within the Spanish currency area may have a significant effect on Spanish foreign trade in minerals. (Imports of phosphate rock in 1964 were valued at about $14.5 million.) The deposits were assigned to INI, the Government holding company, to develop.

Pyrites and Sulfur.—Production of pyrites increased by more than 16 percent sulfur content in 1964, after a 1963 decline of 5.7 percent from 1962 levels of output. Production of elemental sulfur increased sharply from the 1963 figures but failed by a considerable margin to regain the 1962 output level; imports, chiefly from France and the United States, increased sharply by 52 percent and for the first time exceeded domestic production.

Exports of pyrites increased by 18 percent to 1,218,000 metric tons. Exports of elemental sulfur ceased altogether.

---

[11] The Spanish Nitrogen Fertilizer Industry. Nitrogen, No. 33, January 1965, British Sulphur Corp. Ltd. London. pp. 22–25.

Spanish production of sulfuric acid rose by more than 11 percent to a new high of 1,663,000 tons, and completion of new plants is expected to result in a further considerable increase in 1965. In 1964 even the record production was insufficient to meet domestic demand, and import duties were temporarily suspended; imports for the year totaled 30,890 tons. Compañía Española de Minas de Rio Tinto had under construction at Huelva sulfuric acid plants based on roasting of the company's own pyrites, with a capacity of 675 tons per day; it was planned to start a second stage of construction to double this output, immediately after the first stage was scheduled for completion, about mid-1965.[12]

MINERAL FUELS

Coal.—Production of coal (bituminous, anthracite, and lignite) declined by 6 percent from 1963 levels, falling about 500,000 tons below 1962 output. Bituminous output was 7 percent, and anthracite, 6 percent below 1963 output. Production was affected by a serious strike from April to July, but it was reported to be less serious than the similar strike in 1963. As a result of the strike, the Government put into effect a new work regulation for the industry, increasing wages (according to one estimate) by an average of 25 percent. Coal prices were permitted to rise by only 2 percent, but the Government worked out a subsidy arrangement for the mines and gave the industry preference in official credit.

Imports increased by 3 percent to 1,849,688 tons, while exports (always small) declined to a negligible 2,325 tons.

During 1964 the important gas industries of Madrid and Barcelona anounced plans to shift to the use of naphtha, a petroleum product, as raw material for gas manufacture. The gas industry has been an important consumer of coal, accounting for about 400,000 tons or 3.25 percent of total bituminous consumption. The expansion of the thermal power industry, the second largest consumer of coal, may help to take up any slack in demand resulting from the shift of the gas industry to a petroleum base.

Nuclear Fuel.—Spain's reserves of uranium are reputed to be the second largest in western Europe after those of France. Intensive prospecting continued during 1964, and a new deposit was reported in the Pyrenees, about 80 kilometers northwest of Lerida, near Pobla de Segur in the Sierra de Castello. The new deposit is said to contain 0.4 percent of uranium oxide; according to reports, production began in June 1964 and output is expected to be 1,000 tons of ore per day. The ore at the previously known deposit at Andujar Jaen in the south of the peninsula is said to average 0.15 to 0.20 percent uranium oxide.[13] A new concentrating plant is expected to be added soon at this location. Total uranium reserves were estimated at 10,500 tons. Spain's production of uranium is not reported, but is estimated at 64 tons of U_3O_8; 5.2 metric tons of uranium ore was exported to India in 1963. Exports in 1964 totaled 100 kilograms.

---

[12] Mining Annual Review 1965. Mining Journal (London), p. 281.
[13] Annales des Mines, April 1964, p. 245.

Spain embarked on a nuclear power program in 1964 with the authorization of a 150-megawatt nuclear powerplant to be built by Union Electrica Madrilena at Zorita de los Canes, Guadalajara, near Madrid. Westinghouse Electric Corp. is prime contractor for the reactor, which is financed by an Export-Import Bank loan of $24.5 million. It will be of the boiling water, enriched uranium type. The U.S. Atomic Energy Commission will furnish the enriched uranium under an agreement which requires it to buy an equal amount of Spanish natural uranium. A second 300-megawatt nuclear powerplant is planned by Centrales Nucleares del Norte de España (NUCLENOR), a private Spanish company. It is to be built in northern Spain. At the end of the year tenders were expected to be issued soon to three U.S. firms and a British nuclear power group for supply of the reactor.

The availability of domestic sources of uranium and the development of a nuclear power program may have an effect on the future of the coal and petroleum industries in Spain, depending, of course, on the relative economics of the three sources of energy.

Petroleum.—Perhaps the most significant development in the field of mineral fuels was the discovery, in mid-1964, of a small but commercially exploitable petroleum field (designated the Ayoluengo field) in the neighborhood of Burgos. American Overseas Petroleum Company (AMOSEAS), in collaboration with Compañía Arrendataria del Monopolio de Petroles, S.A. (CAMPSA), an INI subsidiary, brought in a well (Ayoluengo 1) in June 1964 which pumped 192 barrels of 36° A.P.I. crude a day; two other wells drilled during the year in the same field struck oil and were awaiting completion tests at the end of the year. The discovery spurred much exploration activity by other firms as well. Of the 18 wells drilled or drilling in 1964 (some in other areas), 4 had "shows" of gas, 2 of oil, and the 3 in the Ayoluengo field produced measurable amounts of oil. In January 1965 a fourth well, Ayoluengo No. 4 (drilling at the end of 1964), flowed 446 barrels per day.[14]

During 1964 Spain agreed to accept shipment of crude oil from the U.S.S.R. Total imports from this source during the year amounted to about 100,000 tons.

Total imports of crude petroleum from all sources rose by 20 percent to 12,618,651 tons. Imports of refined products (exclusive of liquefied petroleum gas) decreased by 40 percent. Exports of refined products (again excluding liquefied petroleum gas) declined by 5.4 percent to 1,820,767 tons, a substantial part of which went to bunkers.

Three new refineries were authorized during the year: One at Huelva (Gulf Oil Corp. and Rio Tinto) with a capacity of 2 million tons; one at Castellon de la Plano (Standard Oil Co. of New Jersey and Banco Español de Credito) with a capacity of 3 million tons; and another at Algeciras (Compañía Española de Petroleos, S.A.) with a capacity of 2 million tons. The Algeciras authorization was conditioned on its output being exported. Meanwhile, progress continued with the construction of the Empresa Nacional Calvo Sotela refinery at Puertollano (capacity 2 million tons). The Petroliber

---

[14] Bulletin of the American Association of Petroleum Geologists. V. 49, No. 8, August 1964, pp. 1218–1222.

Sociedad Iberica Refinadora de Petroleos, S.A. refinery at La Coruña (in which Marathon Oil Co. holds an interest) came on stream in early 1964; its crude is imported from Libya. With the new capacity added by these projects, Spain's prospective total refining capacity by 1967 is estimated at 24 million tons, and early in 1965 there were press reports indicating that no new refinery would be authorized until that total production figure is reached. Petrochemical plants are planned in connection with several of the new refineries.

SOURCE MATERIALS

Statistical data on production were obtained mainly from the official Estadística Minera y Metalúrgica de España, edited by the Consejo de Minería y Metalúrgica and published by the Dirección General de Minas y Combustibles, Ministerio de Industria, and from the Boletín Mensual de Estadística published by Instituto Nacional de Estadística. Some production data for 1964 are preliminary, as reported by the U.S. Embassy at Madrid.

Trade statistics are from the official Estadística del Comercio Exterior de España, published by the Dirección General de Aduanas, Ministerio de Hacienda.

Other information is from reports of the U.S. Embassy, Madrid, press releases of the Export-Import Bank of Washington, D.C., the Spanish Newsletter of the Embassy of Spain at Washington, D.C., and professional and trade journals.

The Mineral Industry of Sweden

By Charles D. Hoyt[1]

THE mineral industry shared strongly in a year of favorable progress for the Swedish economy. Sweden's Gross National Product rose about 7 percent (compared with an average growth of 4.6 percent for the 1960–64 period), export volume rose 11.5 percent, export prices were up 3 percent, and the value of foreign trade reached a record of $7,524 million.[2] Industrial output rose in almost every sector for an average increase of about 9 percent which kept pace with wage increases of 8 percent. Practically all of the mineral industries were operating at full capacity for nearly all of 1964. This resulted in record output levels in iron ore, the country's most important mineral commodity. Total iron ore production was 26.6 million tons, up 12.5 percent over that of 1963. Sweden's iron ore exports, among the most important in the world, were at a record high of 24.7 million tons, an increase of almost 21 percent over the previous high, which was attained in 1963.

The Swedish economy operated at almost full capacity and had an overall unemployment rate of 1.1 percent (0.7 percent for industrial workers). In 1964 lack of skilled labor began to plague Swedish industry. A general labor unbalance exists in the country since the northern sections have unemployment and other parts of the country have labor shortages. Movement of labor continued to be complicated by both a general housing shortage and a lack of desire on the part of workers to move to new areas. Future production increases in the economy will have to come from either capacity additions or modernizations of existing facilities. The mining industry continued to make large capital investments to expand productive capacity and efficiency. In 1964 the largest iron ore producer, Luossavaara-Kiirunavaara Aktiebolag spent $50 million in investments, and the other major firms have been investing at equally high rates.

Sweden continued to have an unfavorable balance of trade principally because of its lack of significant domestic solid and liquid fuel resources. Mineral fuel imports in 1964 amounted to 12.6 percent ($484 million) of total imports, and the trade deficit for the year amounted to $181 million. As a result of the mineral fuel deficiency, the country has developed its hydroelectric power extensively (45.3 million megawatts generated in 1964, compared with 40.5 million megawatts for 1963) and has also entered the nuclear power field. In July 1963 the country's first experimental nuclear-energy powerplant became critical and building is in progress for a commercial nuclear power station to be finished by 1970. To provide the uranium requirements, a uranium concentration mill is under construction at Ranstad in south-central Sweden. The mill is scheduled for completion late in 1965. Uranium-bearing oil shales will be exploited by surface mining to produce a 70 percent uranium concentrate for use in nuclear reactors after further purification.

---

[1] Staff engineer, Office of Program Coordination.

[2] Where necessary values have been converted from Swedish krona (SKr) to U.S. dollars at the rate of SKr 1 equals US$0.193.

It can be anticipated that the Swedish economy will not grow so rapidly during 1965 as it did in 1964. Factors suggesting this are restrictive Governmental monetary policies, increasing labor and material costs, and a possible reduction in private investment. Nevertheless, it appears certain that Swedish mineral production will continue to operate at peak levels of output and that new highs will be established in 1965.

GOVERNMENT POLICIES AND PROGRAMS

The attitude of the Swedish Government toward private investment remained liberal and no program of nationalization existed as official policy. The economy can be described as basically a free market economy with about 95 percent of the manufacturing industry privately owned; however, the Government has continued to exert tight control of domestic monetary policy with the objective of restricting inflation. Some observers feel that this control may be too restrictive and should be liberalized. On November 6, 1964, the official bank discount rate was raised from 4.5 to 5 percent to counter inflationary tendencies within the economy.

Although the manufacturing industry was largely in private hands, the Swedish Government's holdings within the mineral industry remained very high, principally because of almost total ownership (over 95 percent) of the giant iron ore producing company Luossavaara-Kiirunavaara Aktiebolag (LKAB), which produced and delivered about 20 million tons of high-grade iron ore in 1964, nearly all of which was exported. In October 1957, the Swedish State exercised an option to purchase almost complete control of LKAB from Trafikaktiebolaget-Grängesberg-Oxelösund (the Grängesberg Company) which retained about 4.3 percent of the holdings. However LKAB and the Grängesberg Company maintained a joint sales organization and a close relationship for the shipping of ores using Grängesberg's fleet of vessels.

There were no changes in Sweden's mining laws during 1964. Since the passage of the Mining Law of June 3, 1938, the State has the right to a 50-percent share in new mining concerns. Under the Atomic Energy Act of 1956 the Government exerts close control of all activities with potential nuclear power usefulness.

Prior to 1956, foreign corporations could not engage in business in Sweden without establishing subsidiaries as Swedish entities or appointing Swedish firms as trade representatives. This was modified by a law effective January 1, 1956, which enabled corporations to operate under their own name, but Swedish law still requires that foreign individuals or corporations obtain special licenses or permits to operate. These permits are granted by the King-in-Council and apply to specific projects and are not a general authorization to operate within a given field. Foreigners may not stake claims to mineral deposits. The same regulation applies to Swedish partnerships with foreign partners and to Swedish Corporations whose stocks may be owned by foreigners, unless there are certain specific limiting conditions.

In summary, although Swedish laws may appear restrictive to foreign investment, in actual fact the Government has rather wide discretion in applying the laws. Direct investment by 170 U.S. firms at the end of 1963 amounted to $220 million of which the largest share (62 percent) was in petroleum, with manufacturing (16.3 percent) and trade (18.7 percent) accounting for most of the remainder.

PRODUCTION

Mineral and metal production levels for 1964, with few exceptions, were at record levels of output. Iron ore (26.6 million tons) and crude steel (4.4. million tons) production registered gains of 12.5 percent and 13 percent respectively compared with 1963. Iron ore prices in 1964 were 3 percent below those of 1963 (and about 30 percent below those of 1956) therefore investments to improve overall efficiency continued at increasing levels so that profit margins could be maintained. Output of lead and zinc concentrates were at lesser levels, but increased world prices for these commodities raised the overall value of production considerably. Despite the very high levels of output in almost all categories, the number of people actually employed in mining continued to be reduced. During 1964, LKAB reduced its total work force about one-half percent (from 7,056 to 6,670), and other major mining companies also had labor force reductions. Official Government statistics for the 2-year period, 1963–64, show a 14 percent reduction in the number of persons engaged in mining.

TABLE 1.—Sweden: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum	15,984	16,350,	16,900	[r] 20,800	35,400
Arsenic, white	11,750	11,025	[e] 11,000	[e] 11,000	[e] 11,000
Beryllium ore (beryl, U.S. imports)	-------	-------	24	-------	44
Bismuth ... kilograms	[e] 36,000	[e] 36,000	[e] 70,000	[e] 70,000	[r] 70,454
Copper:					
Recoverable content of ore mined	17,477	18,186	[r] 19,091	19,051	19,958
Smelter	21,706	[r] 20,698	22,769	[r] 22,680	22,589
Gold ... thousand troy ounces	94	83	129	167	161
Iron and steel:					
Iron ore ... thousand tons	21,690	23,593	22,023	[r] 23,637	26,660
Pig iron and ferroalloys ... do	1,632	1,900	[r] 1,963	[r] 2,025	2,327
Steel ingots and castings ... do	3,218	[r] 3,652	3,612,	[r] 3,901	4,443
Lead:					
Mine	55,305	63,973	[r] 67,786	[r] 68,700.	65,200
Smelter	[r] 44,554	38,778	[r] 38,770	[r] 40,768	40,600
Selenium ... kilograms	80,200	[e] [r] 97,000	[e] [r] 70,000	[e] [r] 90,000	[e] 90,000
Silver ... thousand troy ounces	2,756	[r] 2,950	[r] 3,367	[r] 3,582	3,061
Tungsten, 60 percent WO_3 basis	282	313	[r] 268	[r] 356	NA
Uranium oxide (U_3O_8)[e]	9	9	9	9	9
Zinc, recoverable content of ore and concentrate	74,230	79,431	[r] 81,853	[r] 81,400	71,600
Nonmetals:					
Cement ... thousand tons	2,806	3,012	3,054	3,250	3,567
Diatomite ... do	411	710	[e] 700	[r] 710	[e] 1,000
Feldspar	55,392	[r] 56,764	[e] 57,000	[r] 45,641	51,600
Fluorspar	2,914	[r] 3,213	3,500	[r] 2,951	[e] 3,000
Kaolin	26,729	[r] 27,048	26,228	[r] 31,723	44,000
Lime (quicklime, hydraulic, and dead-burned dolomite)	936,720	885,695	703,094	878,800	971,800
Mica, ground	158	[r] 50	[r] 57	[r] 20	NA
Pyrite, gross weight	412,300	438,200	376,100	402,600	NA
Sulfur, elemental byproduct recovered	40,000	31,000	30,400	26,300	NA
Talc, soapstone, and pyrophyllite	15,845	[r] 15,700	[r] 17,419	[r] 18,775	NA
Mineral fuels:					
Briquets and packaged fuel ... thousand tons	54	62	43	[e] 60	[e] 40
Coal, bituminous ... do	251	200	148	[r] 99	85
Coke:					
Low and medium temperature ... do	598	600	582	570	530
Oven and beehive ... do	134	266	344	[r] 343	375
Peat:					
Agricultural ... do	70	[e] 65	55	[e] [r] 70	[e] 65
Fuel ... do	210	229	153	[e] 250	[e] 250
Petroleum refinery products:					
Gasoline ... thousand 42-gallon barrels	2,864	3,359	3,175	3,307	4,352
Jet fuel ... do	1,051	1,247	367	-------	-------
Kerosine ... do	110	-------	-------	[1] 39	[1] 23
Distillate fuel oil ... do	4,015	4,100	5,023	4,789	5,685
Residual fuel oil ... do	9,261	7,793	8,102	8,585	10,956
Lubricants ... do	114	314	327	434	455
Other ... do	1,447	1,197	1,900	[2] 3,569	[2] 4,575
Total salable ... do	18,862	18,010	18,894	20,723	26,046
Refinery fuel (includes losses) ... do	1,348	878	844	1,216	1,110
Total input ... do	20,210	18,888	19,738	21,939	27,156

[e] Estimate. [r] Revised. NA Not available.

[1] Includes jet fuel.

[2] Includes refinery gas, aviation fuels, asphalt, paraffins and waxes, petroleum feedstocks, and coke.

TRADE

Foreign trade in 1964 was at an alltime high, with exports increasing about 15 percent and imports up almost 14 percent compared with 1963. In 1964 shipments of practically all of the Swedish mineral commodities that are exported were at increased levels. Exports of iron ore were at a record level of 24.3 million tons and provided returns of $207 million which was 5.6 percent of total exports. The values for exports of all types of ores amounted to $235 million which was 6.4 percent of total exports. Finished steel exports were up 15 percent over those of 1963 and amounted to about 970,000 tons. Sweden's exports of all types of iron and steel were valued at $291 million which equaled almost 8 percent of total exports. Among mineral commodity exports, the only other items of relative world significance were lead and zinc ores and roasted pyrites. The combined value of these three for 1964 was about one-tenth that of the value of iron ore exports.

On the import side, mineral fuels, both solid and liquid, dominated. Imports of mineral fuels amounted to $484 million, which represented 12.6 percent of total imports for the year. Iron and steel imports amounted to an additional 5.35 percent of total imports ($206 million).

In 1964 Sweden's principal trade continued to be with West Germany, the United Kingdom, Norway, Denmark, and the United States. Most of Sweden's minerals were exported to Western Europe, with West Germany, the United Kingdom, and Belgium-Luxembourg being the major customers. In 1964 Sweden conducted somewhat more trade with other European Free Trade Association (EFTA) members (36.5 percent) than it did with European Economic Community (EEC) countries (34.5 percent). The EEC countries purchased about 24 percent less of Sweden's goods in terms of value than Sweden exported to the EEC. The reverse was true for the EFTA members; these nations bought about 23 percent more than they sold to Sweden.

Among mineral commodities, Sweden imported significant amounts of coking coals and molybdenum concentrate from the United States. The country also remained dependent on imports for more than half of its copper supply, all of its oil, and practically all of its aluminum, chromium, manganese, titanium, tungsten, vanadium, tantalum, and zirconium ores and concentrates.

Since Sweden depends heavily on foreign trade and its merchant fleet earnings, its policy remained very liberal toward expanding foreign trade. The country maintained one of the lowest tariff levels in the world for industrial goods.

TABLE 2.—Sweden: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Scrap	835	815	NA.
Unwrought	[r] 246	509	United States 247; Denmark 162; Finland 48.
Wrought	[r] 7,511	10,120	Finland 2,871; Norway 2,524; Denmark 2,406.
Antimony, unwrought	10	NA	NA.
Arsenic, white	7,843	NA	NA.
Cobalt	13	NA	NA.
Copper:			
Scrap	[r] 555	667	West Germany 340; Netherlands 186; France 56.
Refined	16,139	18,980	NA.
Alloys	1,920		
Bars, rods, angles, sections, wire	[r] 16,863	16,324	NA.
Plates, sheets, and strip	[r] 4,247	4,124	NA.
Foil	[r] 6,012	9,319	NA.
Other wrought	[r] 2,048	2,268	Norway 853; Denmark 506; United States 485.
Gold bullion (approximate). troy ounces	52,000	NA	NA.
Iron and steel:			
Ore and concentrate. thousand tons	[r] 19,397	20,255	NA.
Roasted pyrites do	[r] 201	231	West Germany 170; United Kingdom 60.
Scrap	[r] 11,470	11,802	West Germany 7,579; Norway 1,744; Belgium-Luxembourg 1,089.
Pig iron	[r] 34,967	56,899	Denmark 11,860; Netherlands 10,54 Norway 8,963.
Shot, grit, and pellets	[r] 1,183	1,236	Poland 380; Norway 324; West Germany 214.
Powder and sponge	32,965	40,428	NA.
Ferroalloys:			
Ferromanganese	[r] 2,579	4,350	West Germany 2,831; United Kingdom 655; Austria 507.
Ferrosilicon	4,658	2,880	West Germany 1,599; Austria 832; Australia 203.
Ferrochrome	17,331	22,976	United Kingdom 7,625; United States 6,970; Italy 2,412.
Ferrosilico-chrome	2,416	1,868	United Kingdom 1,001; Italy 340; Australia 319.
Other	664	679	United States 76; Spain 74; Brazil 65.
Steel:			
Ingots	[r] 3,629	3,721	Norway 3,655.
Blooms, billets, slabs, etc	[r] 115,321	100,658	Israel 25,452; Finland 22,830; Greece 18,009.
Bars and rods	[r] 113,313	118,650	United States 19,570; United Kingdom 19,330; West Germany 12,072.
Wire rod	[r] 59,427	84,347	West Germany 23,737; United States 17,315; United Kingdom 14,117.
Angles, shapes, and sections	[r] 27,473	23,392	West Germany 13,892; Norway 4,789; Finland 2,198.
Heavy plates and sheets (uncoated).	[r] 125,014	144,404	West Germany 44,83?; Italy 31,672; Norway 17,318.
Other uncoated plates and sheets.	[r] 38,688	55,716	Denmark 10,051; Italy 8,136; West Germany 6,562.
Plates, sheets (coated), hoops and strips.	[r] 33,911	38,920	United States, 5,144; West Germany 5,115; Norway 4,887.
Railway track material	[r] 29,656	43,875	United Arab Republic (Egypt) 25,007; Norway 9,827; West Germany 2,478.
Tubes, pipes, and fittings	[r] 113,046	151,595	U.S.S.R. 61,071; West Germany 17,990; Netherlands 8,677.
Castings and forgings	[r] 706	728	Norway 208; Italy 163; West Germany 158.
Lead:			
Ore and concentrate	42,639	42,049	West Germany 28,214; Belgium-Luxembourg 10,745; Netherlands 3,055.
Lead and lead alloys, unwrought	[r] 14,483	14,165	Norway 4,030; United States 3,565; Finland 1,261.
Scrap	53	173	Norway 164.
Lead, wrought	239	27	United Arab Republic (Egypt) 12; West Germany 6; Norway 5.

See footnotes at end of table.

TABLE 2.—Sweden: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals—Continued			
Magnesium:			
Unwrought	28	--------	
Scrap	[r] 194	173	United Kingdom 87; United States 30; Norway 27.
Semimanufactures	7	10	All to Norway.
Manganese:			
Ore and concentrate	492	1,311	Finland 668; Czechoslovakia 300; Yugoslavia 112.
Metal	17	70	Norway 67.
Mercury .... 76-pound flasks	[r] 87	87	Norway 58; Denmark 29.
Molybdenum:			
Ore and concentrate	102	6	All to United Kingdom.
Metal, unwrought and semimanufactures.	7	8	United States 1.
Nickel:			
Scrap	[r] 77	56	United Kingdom 41.
Metal and alloys:			
Unwrought	[r] 125	9	Netherlands 8.
Semimanufactures	[r] 599	703	Denmark 193; United States 175; Norway 72.
Selenium	50	88	NA.
Silver: Bullion . thousand troy ounces	1,591	1,202	NA.
Tin:			
Unwrought, including alloys. long tons	[r] 239	126	Finland 65; West Germany 28; Denmark 27.
Scrap .... do	[r] 18	37	West Germany 14; Norway 12; United Kingdom 12.
Semimanufactures .... do	1	4	Norway 1; Finland 1.
Titanium:			
Ore and concentrate	26	25	All to Finland.
Metal	1	4	Finland 2; West Germany 1.
Tungsten:			
Ore and concentrate	--------	18	All to India.
Metal	26	102	United States 51; West Germany 40; Finland 2.
Uranium: Metal	(1)	5	NA.
Vanadium, tantalum, zirconium: Ore and concentrate.	12	41	Norway 38.
Zinc:			
Ore and concentrate	149,519	148,393	Belgium-Luxembourg 83,967; Norway 37,268; West Germany 17,884.
Unwrought	110	72	Denmark 14; Finland 12; France 11.
Scrap	[r] 1,766	1,086	Norway 462; Italy 367; United Kingdom 112.
Semimanufactures	[r] 51	25	Denmark 15.
Nonmetals:			
Asbestos	12	54	Netherlands 44.
Barite and witherite	--------	6	NA.
Cement, hydraulic	134,937	105,206	NA.
Chalk, including ground	[r] 4,317	3,179	Finland 1,947; Norway 610.
Clays:			
Kaolin	10	11	NA.
Fire clay	4,547	4,236	West Germany 2,766; Finland 1,437.
Bentonite	106	21	NA.
Other	2,097	2,176	Finland 1,988; Norway 64.
Corundum:			
Pumice, emery, and other natural abrasives.	[r] 70	78	West Germany 5; Netherlands 5.
Artificial	842	1,664	West Germany 553; Italy 382; Denmark 303.
Diatomite and other siliceous earths	26	33	Norway 12; Finland 9.
Dolomite	[r] 5,886	3,836	Denmark 2,525; Norway 924.
Feldspar, leucite, nepheline, nepheline-syenite.	31,071	26,080	Belgium-Luxembourg 6,645; Netherlands 5,901; United Kingdom 3,472.
Flint (crushed rock)	[r] 484,907	473,361	West Germany 419,920; Denmark 50,596; Norway 909.
Fluorspar	482	150	Finland 125.
Graphite (natural)	26	36	All to West Germany.
Gypsum	111	17	NA.
Lime (including slag)	5,204	5,721	Norway 5,613.
Limestone, industrial	282,166	395,260	West Germany 271,693; Finland 74,114; Denmark 40,420.
Magnesite, natural or ground	[r] 200	193	Denmark 150; France 22; United Kingdom 19.

See footnotes at end of table.

TABLE 2.—Sweden: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Nonmetals—Continued			
Mica, including splittings and waste	8	6	NA.
Natural pigments	11	28	Norway 16.
Pyrites	23,888	14,055	United Kingdom 13,533.
Quartz and quartzite	[r] 110,556	73,031	West Germany 31,059; Denmark 28,267; United Kingdom 6,917.
Salt, refined and other	297	1,245	Denmark 1,145.
Sand, natural (excluding metallurgical sand):			
Quartz sand	[r] 28,230	27,190	Denmark 8,452; Norway 8,410; Finland 7,570.
Other industrial	8,650	4,357	Norway 2,125; Denmark 1,365.
Shale	60	210	Denmark 127; Netherlands 60.
Stone, dimension:			
Calcareous	[r] 12,216	10,994	Denmark 9,078; West Germany 497; Netherlands 386.
Other	[r] 204,266	120,913	West Germany 62,423; Denmark 25,466; Japan 4,542.
Sulfur:			
Natural	[r] 160	139	Denmark 82.
Elemental	[r] 177	51	Netherlands 40.
Talc and steatite	[r] 2,001	1,458	Denmark 783; France 324.
Thomas slag	8,149	6,820	Finland 6,720.
Mineral fuels:			
Coal:			
Anthracite	849	1	NA.
Bituminous and briquets	19,382	22,918	Denmark 21,108; Belgium-Luxembourg 1,650.
Coke, including coke briquets	6,335	7,262	West Germany 3,640; Denmark 3,566.
Peat	5,028	6,778	Denmark 3,553; United States 3,032.
Petroleum:			
Crude petroleum, including shale oil. thous. 42-gal. bbls	[r] 8	1	NA.
Refinery products:			
Gasoline, including white spirit. do	111	556	Norway 339; Denmark 210; Finland 7.
Kerosine do	9	59	All to Norway.
Distillate fuel oil do	306	493	Norway 294; Denmark 157; Netherlands 35.
Residual fuel oil do	180	258	Denmark 143; Norway 58; Netherlands 31.
Lubricating oil do	283	307	Finland 146; Norway 71; Denmark 42.
Liquefied petroleum gas. do	2	36	Denmark 24; Norway 12.
Asphalt do	229	191	Denmark 106; Norway 40; Finland 37.

Revised. NA Not available.
Less than ½ unit.

TABLE 3.—Sweden: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Bauxite	24,233	13,790	Greece 13,738.
Alumina	[r] 40,516	39,115	Jamaica 34,353; West Germany 4,362; United States 239.
Scrap	[r] 715	323	Finland 252; Denmark 40.
Metal and alloys unwrought	[r] 30,819	36,696	Canada 14,837; Norway 13,083; Switzerland 1,834.
Semimanufactures:			
Plates and sheets	[r] 10,020	10,605	Belgium-Luxembourg 3,487; United Kingdom 2,326; France 918.
Other	[r] 4,108	4,252	NA.
Antimony, unwrought	392	446	U.S.S.R. 80; Finland 15; Japan 8.
Arsenic, white	3	---	
Cadmium, unwrought	104	188	U.S.S.R. 80; Bulgaria 20; United States 19.

See footnotes at end of table.

TABLE 3.—Sweden: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Chromium:			
Chromite	^{r}105,807	115,155	U.S.S.R. 56,186; Yugoslavia 19,159; Fed. of Rhodesia and Nyasaland 16,742.
Metal	33	107	United Kingdom 93; Japan 9; West Germany 5.
Cobalt, unwrought	152	132	Belgium-Luxembourg 118; United States 6; France 4.
Copper:			
Ore and concentrate	21,635	78,800	Chile 38,348; Finland 18,934; Canada 8,504.
Matte	9,404	7,347	France 6,292; Norway 925; Belgium-Luxembourg 130.
Scrap	^{r}1,523	3,225	Norway 1,362; France 691; Denmark 579.
Refined, unwrought	^{r}73,231	66,668	Chile 26,899; Fed. of Rhodesia and Nyasaland 14,019; Belgium-Luxembourg 11,948.
Other, unwrought	^{r}1,907	2,005	Chile 1,456; France 539.
Copper and copper alloy, semimanufactures.	^{r}9,518	12,554	Finland 3,376; West Germany 2,742 United Kingdom 1,673.
Gold:			
Ore and concentrate	1,012	2,167	Bulgaria 2,071; Fed. of Rhodesia and Nyasaland 63; Australia 33.
Bullion troy ounces	354,000	160,750	Mainly from United Kingdom.
Iron and steel:			
Ore and concentrate. thousand tons	^{r}4	2	Nearly all from Denmark.
Roasted pyrites do	20	15,371	Morocco 9,145; Norway 5,676; Portugal 550.
Scrap	29,410	123,001	United Kingdom 89,943; Denmark 13,542; Ireland 4,405.
Pig iron	^{r}181,297	187,993	U.S.S.R. 68,856; Finland 63,788; West Germany 21,565.
Spiegeleisen	102	203	All from West Germany.
Shot, grit, and pellets	^{r}2,910	3,328	United Kingdom 2,656; West Germany 361; Belgium-Luxembourg 165.
Sponge and powder	^{r}549	951	United States 868; West Germany 34; Netherlands 22.
Ferroalloys:			
Ferromanganese	^{r}10,143	12,364	U.S.S.R. 4,431; Norway 3,553; France 1,020.
Ferrosilicon	6,141	7,472	Norway 6,566; West Germany 555; United Kingdom 160.
Ferrosilico-manganese	3,641	7,394	Norway 7,294; Poland 57; Yugoslavia 39.
Ferrochrome and ferrosilicochrome.	3,537	5,437	Norway 3,856; Yugoslavia 544; Czechoslovakia 302.
Other	1,146	3,588	France 894; U.S.S.R. 464; United Kingdom 410.
Ingots and equivalent primary forms.	^{r}12,442	6,972	West Germany 5,555; Norway 520; United States 416.
Bars and rods	^{r}82,261	93,162	France 26,322; West Germany 18,376; Belgium-Luxembourg 14,396.
Angles, shapes, and sections	^{r}137,839	131,070	West Germany 42,843; Belgium-Luxembourg 41,331; Norway 13,489.
Plates and sheets	^{r}477,630	463,712	West Germany 91,396; Belgium-Luxembourg 71,522; Denmark 48,771.
Tinplate	^{r}56,758	61,209	United Kingdom 27,158; France 18,623; United States 6,140.
Other coated sheets	^{r}35,435	43,309	Belgium-Luxembourg 22,572; United Kingdom 7,154; France 6,546.
Hoop and strip	^{r}36,192	45,616	United Kingdom 15,026; Belgium-Luxembourg 12,217; West Germany 7,962.
Railway track material	^{r}4,564	4,523	West Germany 2,635; Belgium-Luxembourg 1,050; Austria 493.
Pipes, tubes, and fittings	^{r}147,206	142,546	West Germany 56,732; France 27,082; United Kingdom 19,346.
Castings and forgings	^{r}2,569	2,556	Poland 1,808; Denmark 283; Norway 258.
Lead:			
Scrap	312	593	Norway 585.
Unwrought, including alloys	^{r}12,880	8,213	Peru 2,919; Mexico 2,794; Belgium-Luxembourg 976.
Semimanufactures	^{r}2,372	2,071	Belgium-Luxembourg 907; West Germany 434; Norway 420.
Magnesium:			
Unwrought	^{r}496	498	Norway 349; United Kingdom 115; West Germany 18.
Semimanufactures	^{r}34	76	United Kingdom 37; West Germany 13; France 10.

See footnotes at end of table.

TABLE 3.—Sweden: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Manganese:			
Ore and concentrate	[r] 57,807	77,373	Rep. of South Africa 26,100; U.S.S.R. 20,286; Ivory Coast 15,681.
Metal, unwrought	933	1,133	Rep. of South Africa 622; Norway 242; U.S.S.R. 174.
Mercury 76-pound flasks	3,710	4,061	Spain 2,176; Italy 1,508; United Kingdom 262.
Molybdenum:			
Ore and concentrate	1,948	2,332	United States 1,076; Chile 821; Norway 390.
Unwrought and semimanufactures	27	23	West Germany 9; United States 6; United Kingdom 4.
Nickel:			
Matte, speiss, etc	364	345	All from Canada.
Scrap	96	270	United States 164; Norway 40; United Kingdom 18.
Metal and nickel alloys, unwrought.	[r] 7,947	8,587	Norway 4,115; United Kingdom 2,399; Canada 1,576.
Metal and nickel alloys, semimanufactures.	[r] 984	983	United Kingdom 440; Norway 166; West Germany 142.
Platinum-group metals:			
Unwrought troy ounces	(1)	(1)	NA.
Semiwrought and wrought do	(1)	(1)	NA.
Selenium	8	1	Mainly from Japan.
Silver, bullion troy ounces	386,000	450,000	Mainly from United Kingdom and West Germany.
Tantalum	(1)	(1)	NA.
Tin:			
Scrap long tons	[r] 139	---	
Unwrought do	[r] 909	781	United Kingdom 278; mainland China 271; West Germany 69.
Semimanufactures do	[r] 104	115	United Kingdom 61; West Germany 19; Norway 15.
Titanium:			
Ore and concentrate	4,494	3,670	Australia 3,580; India 90.
Metal	51	61	United Kingdom 39; United States 11; Japan 7.
Tungsten:			
Ore and concentrate	[r] 3,287	1,297	Republic of Korea 329; U.S.S.R. 319; Mainland China 251.
Metal	[r] 77	69	West Germany 62; France 3; United Kingdom 3.
Vanadium, tantalum, zirconium:			
Ore and concentrate	432	1,273	Australia 1,221; Madagascar 1.
Zinc:			
Unwrought	[r] 36,480	28,017	Norway 11,159; Poland 5,261; U.S.S.R. 2,965.
Zinc dust	135	168	Norway 97; United Kingdom 65.
Other wrought	[r] 1,242	1,134	West Germany 372; Belgium-Luxembourg 332; Poland 309.
Scrap	---	56	All from Norway.
Nonmetals:			
Abrasives:			
Pumice, emery, and other natural abrasives.	[r] 1,122	1,325	Greece 395; United States 288; Italy 266.
Artificial	4,398	3,681	West Germany 1,327; United States 1,180; East Germany 577.
Asbestos	[r] 18,854	15,624	Canada 5,666; Fed. of Rhodesia and Nyasaland 3,120; Cyprus 2,076.
Barite and witherite	1,684	1,294	West Germany 1,252.
Boron compounds	605	5,448	West Germany 2,685; United States 2,328; France 125.
Cement (hydraulic)	[r] 24,979	19,605	Denmark 11,848; Norway 5,989; West Germany 1,051.
Chalk (including ground)	[r] 8,800	10,868	Denmark 9,009; France 1,656.
Clays:			
Kaolin	131,222	138,634	United Kingdom 128,441; West Germany 2,959; United States 2,345.
Fire clay	41,881	40,083	United Kingdom 16,232; West Germany 11,576; Czechoslovakia 11,513.
Bleaching earths	30	31	NA.
Bentonite	2,086	2,161	United States 1,765; Hungary 320.
Other	11,045	6,753	India 2,512; West Germany 2,507; United Kingdom 674.
Cryolite and chiolite (natural)	[r] 939	501	All from Denmark.

See footnotes at end of table.

TABLE 3.—Sweden: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals—Continued			
Diamond:			
Industrial	NA	NA	Mainly from United Kingdom and Netherlands.
Other	NA	NA	Mainly from Belgium-Luxembourg and Netherlands.
Diatomite and other siliceous earths	[r] 5,164	7,407	Denmark 3,621; United States 1,674; Hungary 1,628.
Dolomite	[r] 24,882	20,365	Norway 12,537; Belgium-Luxembourg 6,085; Hungary 1,027.
Feldspar, leucite, nepheline, nepheline-syenite.	892	318	Norway 205; West Germany 103.
Flint and crushed rock	[r] 12,641	15,692	Denmark 8,084; Finland 2,449; West Germany 1,542.
Fluorspar	14,323	10,698	Rep. of South Africa 7,701; France 1,560; Mainland China 570.
Graphite (natural)	[r] 833	924	Norway 287; Austria 267; West Germany 261.
Gypsum and anhydrite	[r] 269,493	273,727	Poland 113,765; France 96,189; West Germany 19,489.
Lime, including slag	[r] 5,061	9,208	Denmark 8,953; United States 93.
Limestone, industrial	[r] 38,643	50,107	Denmark 18,722; Norway 18,197; United Kingdom 12,175.
Magnesite, natural or ground	[r] 4,488	6,830	Netherlands 4,790; Austria 1,389; West Germany 176.
Mica, including splittings and waste	[r] 1,132	1,173	Norway 526; India 229; West Germany 160.
Natural pigments	[r] 292	337	West Germany 104.
Phosphate rock	[r] 397,746	385,051	Morocco 289,980; United States 43,808; U.S.S.R. 33,487.
Pyrites	83,438	63,932	Norway 63,832.
Quartz and quartzite	[r] 1,606	1,684	Norway 1,458.
Salt:			
Refined	358,910	638,377	Netherlands 272,487; West Germany 167,679; United Kingdom 96,639.
Other	237,480		
Sand, natural (excluding metallurgical sand):			
Quartz sand	127,979	145,350	Belgium-Luxembourg 100,571; Denmark 34,070; West Germany 5,291.
Other industrial	18,467	9,810	Denmark 5,033; Belgium-Luxembourg 2,141; Norway 462.
Shale	[r] 8,885	10,200	West Germany 5,844; Norway 3,933; Denmark 391.
Stone, dimension:			
Calcareous	[r] 4,752	4,131	Italy 2,844; Belgium-Luxembourg 1,168; Rumania 114.
Other	[r] 3,065	2,459	Norway 2,339.
Sulfur:			
Natural	[r] 82,538	85,734	France 46,574; Poland 18,927; United States 9,388.
Elemental	[r] 139	239	West Germany 108; United Kingdom 50; United States 26.
Talc and steatite	[r] 10,596	13,074	Norway 8,051; Australia 2,133; United States 1,344.
Mineral fuels:			
Anthracite	52,546	70,731	U.S.S.R. 53,010; United Kingdom 9,035; Finland 8,428.
Bituminous and briquets	1,862,704	1,705,999	United States 723,131; Poland 420,356; United Kingdom 182,654.
Carbon black	[r] 17,455	16,708	Netherlands 6,953; United Kingdom 5,849; United States 1,778.
Coal and mineral tar	5,073	3,442	United Kingdom 3,022.
Coke:			
High temperature (metallurgical)	44,746	42,316	West Germany 26,302; Belgium-Luxembourg 7,631; United Kingdom 5,288.
Other and coke briquets	1,478,661	1,569,656	West Germany 881,342; United Kingdom 230,350; U.S.S.R. 197,003.
Lignite and lignite briquets	15,111	16,220	East Germany 14,793; Denmark 991.
Peat	24	38	NA.
Petroleum:			
Crude, including shale oil. thous. 42-gal. bbl.	17,521	19,594	Saudi Arabia 9,341; Iran 6,337; Venezuela 3,081.
Partly refined petroleum, including topped crudes. do	578	505	NA.

See footnotes at end of table.

TABLE 3.—Sweden: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Mineral Fuels—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline......thous. 42-gal. bbl..	15,938	16,849	Netherlands 6,364; United Kingdom 3,136; Bahrain 2,063.
Kerosine and jet fuel.....do....	2,525	2,846	Netherlands 821; United Kingdom 717; Netherlands Antilles 665.
White spirit..............do....	406	836	NA.
Distillate fuel oil..........do....	36,777	41,382	Netherlands 10,901; United Kingdom 7,754; Venezuela 4,385.
Residual fuel oil..........do....	31,895	34,935	U.S.S.R. 15,530; United Kingdom 7,063 Netherlands 4,683.
Lubricating oil............do....	904	907	United States 412; Netherlands 190; United Kingdom 125.
Liquefied petroleum gases. do....	9	72	Norway 31; West Germany 22.
Petrolatum and paraffin..do....	85	79	West Germany 39; United States 12; Netherlands 6.
Asphalt..................do....	79	244	Netherlands 118; France 58; United Kingdom 23.
Petroleum coke...........do....	56	71	United States 49; West Germany 19; Netherlands 2.
Other bitumens...........do....	339	....	
Total refinery products..do....	89,013	98,221	

r Revised. NA Not available.
[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Iron Ore.—Production and exports of iron ore reached new highs in 1964 as the giant Government-owned firm, LKAB, produced 19.7 million tons from its Kiruna (15.1 million tons) and Malmberget (4.6 million tons) mining operations. Actual deliveries by LKAB amounted to 20.3 million tons (by withdrawal from stocks) of which almost 80 percent was shipped via the Norwegian port Narvik, with the balance going through the Swedish Baltic port, Luleå. As in the past West Germany, Belgium-Luxembourg, and the United Kingdom were the leading customers, respectively, accounting for 40, 27, and 20 percent of total export. The LKAB mines have underway an expansion program aimed at a production of over 25 million tons of iron ore by the late 1960's. In June 1964 a new ore harbor was completed at Luleå increasing the capacity to 9 million tons (3.6 million tons shipped in 1964). The Svappavaara mine near Kiruna began production in late 1964. Full production of 3 million tons annually is scheduled in 1966. Ore from this mine will provide feed for a new 2-million-ton pelletizing plant being built at Kiruna and scheduled to be finished in the spring of 1965. A pelletizing plant at Malmberget produced 500,000 tons of pellets in 1964. This facility was being expanded so that by 1967 it will be able to produce 1 million tons annually.

Sweden's second largest iron ore producer, the Grängesberg Company, produced 2.73 million tons in 1964, up 7.5 percent over 1963 output. Three-fourths of this production came from operations at Grängesberg and the balance from the Stråssa mine. Deliveries of ore were even higher at 2.82 million tons, an increase of 10.5 percent over those of 1963. Exports were 2.08 million tons. The principal export customers were the United Kingdom (63 percent) and West Germany (24 percent). A new pelletizing plant at Stråssa produced 220,000 tons in 1964. Construction began on a duplicate pelletizing plant which is to be completed in the summer of 1966. About ⅕ of the company's iron ore output was used for iron and steel production in its steel plant at Oxelösund.

Iron and Steel.—Swedish crude steel output in 1964 was at a new record level of 4.4 million tons, up about 14 percent over that of 1963. Pig iron production also reached a new high of 2.2 million tons, up 15 percent. Output of finished steels also increased to a new high of 2.95 million tons, an increase of 12.4 percent over that of 1963. The iron and steel industry consisted of 30 companies, 1 Government-owned, and employed about 45,000 persons.

Exports of finished steel were over 970,000 tons, up almost 24 percent over the previous year's level. The Grängesberg Company's steel plant at Oxelösund, which was completed in 1961, produced 353,000 tons of heavy plate in 1964, 29 percent more than in 1963. The company also produced 644,000 tons of pig iron of which 64 percent was consumed by its own plants and the balance sold. The second stage of expansion at the Oxelösund plant was completed and the next expansion stage was initiated in 1964. By 1967–68 the annual capacity for heavy plate is expected to go up to 500,000 tons and for hot rolled medium plate to 50,000 tons. Output at the Oxelösund works is expected to increase by about 10 percent during 1965.

Among the Swedish steel industry the three largest producers remained Stora Kopparberg Domnarfvet (900,000 tons), Norrbotten Järnverk (500,000 tons), and the Oxelösund works of the Grängesberg Company. The country's steel industry has long been a producer of specialty steels of all types, and although Sweden is one of the world's largest exporters of stainless and other special steels, it has consistently been a net importer of less-sophisticated forms of steel. But the value of the specialty and other steel exports has far exceeded the value of the imported steels, which have been commercial types such as girders, plates, and sheets. Sweden's apparent consumption of finished steels for 1964 was 3.27 million tons, up 13.5 percent over 1963.

Nonferrous Metals.—The Boliden Mining Co., Ltd. (Bolidens Gruvaktiebolag), which employed 4,133 persons in 1964, maintained its dominant position in the Swedish nonferrous mining industry. A brief review of this firm's extensive operations and holdings will illustrate this dominance. The company produces nearly all of Sweden's nonferrous and precious metals. The parent Boliden Company operated 13 mines with about 2,400 workers, which produced 3.12 million tons of various nonferrous ores in 1964, an increase of about 3 percent over that of 1963. All of the zinc concentrates and a part of the lead concentrates, as in the past, were exported for smelting, while the remainder of the lead concentrates and all of the copper concentrates were shipped to the large smelting complex at Rönnskär, which employed over 1,600 persons. The Rönnskär works contains copper and lead smelters, a precious metals refinery, arsenic refinery, a selenium refinery, sulfuric acid plant, and a new slag fuming plant which started operations in 1964. The Rönnskär works treated the company's own ores plus some imported and toll materials, principally copper bearing, and in 1964 produced the following products: 400,000 tons of pyrites, 45,700 tons of refined copper, 40,600 tons of lead, 18,000 tons of white arsenic, 14,800 tons of zinc clinker, 55,900 tons of sulfuric acid, 160,000 troy ounces of gold, 95,200 kilograms of silver, and 4,600 tons of lead oxides. In addition appreciable amounts of selenium, lead dust pellets, lead-bismuth alloy, and nickel sulfate also were recovered.

In the past 2 years Boliden has diversified considerably and thus provided outlets for many of its products. In 1963, it obtained control of Sweden's largest producer of sulfuric acid, Reymersholms Gamla Industri A.B. and the country's leading fertilizer producer, Forenade Superfosfatfabriker. These acquisitions, known collectively now with other holdings as the Boliden Group, provide natural integrated outlets for the parent company's pyrite and sulfuric acid production. In 1963 Boliden also began negotiations for the purchase of half of the share capital of the Norwegian-based, zinc producer, Det Norske Zinkkompani A/S. This transaction was successfully completed during the year. Boliden shipped most of its zinc concentrate (total 1964 output 90,100 tons) and zinc clinker (70 to 75 percent Zn content) to its new partner for refining.

As a result of greatly improved nonferrous metal prices in 1964, Boliden had a most successful year. Sales were up 43.4 percent to $90.8 million. Average sale prices for zinc, lead, and copper were up 79, 59, and 34 percent respectively. Total ore reserves for the Boliden mines remained at about 65 million tons. Work was started on a new sulfuric acid plant at the Rönnskär works. Completion is scheduled for mid-1965. Total acid output for this copper and lead smelter, flue-gas recovery plant will be 175,000 tons annually. The slag fuming plant that went onstream in 1964 will produce 25,000 tons of zinc clinker and 5,000 tons of lead dust pellets annually at full capacity. The Boliden complex of companies (about 27 in all) produces a wide variety of metallic and chemical products. With its recent acquisitions, it can now be expected to fully integrate all the various operations to achieve the most desirable balance of output and product line.

MINERAL FUELS

Imported petroleum continued to be the dominant source of energy for Swedish consumers in 1964, supplemented significantly by hydroelectric power produced in the country. Complete data for 1964 energy consumption are not available, but presumably the nation's energy balance was little changed on a percentage distribution by source basis from that of 1963, when petroleum, almost entirely imported either as crude oil for refining in Sweden or as finished products, supplied about 73 percent of total energy consumed and hydroelectric power accounted for almost 16 percent of the total. The higher level of industrial activity in 1964, however, presumably led to increases in energy consumption over the 1963 level of 30.02 million metric tons of standard coal equivalent.

Coal.—Domestic coal mining continued but on a very limited scale and at a level lower than in 1963. Termination of coal mining in a few years was forecast.

TABLE 4.—Sweden: Production, trade, and consumption of energy

(Million metric tons of standard coal equivalent)

	1962	1963
Production:		
Coal and lignite	0.10	0.06
Crude petroleum	.13	.10
Hydropower and electric power	4.88	4.74
Total	5.11	[1] 4.91
Net imports (all sources of energy)	24.54	26.41
Bunkers (solid and liquid fuels)	1.07	1.18
Inland comsumption:		
Solid fuels	3.34	3.27
Liquid fuels	20.40	22.00
Hydropower and nuclear power	4.79	4.74
Total	28.53	[1] 30.02
Indicated additions to stocks, solid and liquid fuels	.05	1.12

[1] Detail does not add to total because of rounding.

Source: Department of Economic and Social Affairs, Statistical Office of the United Nations, New York. World Energy Supplies, 1960–63. Statistical Papers, Series J, No. 8, 1965, pp. 20–21.

Petroleum.—*Crude Oil and Oil Shale.*—Operations at Sweden's only operating domestic source of crude oil, the Kvarntorp plant of Svenska Skifferolje, continued at about the same level as in 1963. Early in 1964, the Government approved a 5-year petroleum exploration rights grant to Svenska British Petroleum, an affiliate of the British Petroleum Co. Ltd. (BP), for an area in Skååne Province. Studies concerning legal aspects of Continental shelf exploration were underway by a government-industry committee, and it was indicated that no licenses would be granted until these problems were studied and necessary legislation enacted.

Refinery Products.—Sweden's refinery capacity, at about 78,000 barrels per day at yearend, was capable of meeting only about 25 percent of the nation's demand, which on a per capita basis, remained one of the world's highest.

Completion of BP's new 80,000-barrel-per-day refinery at Gothenburg, scheduled for 1966, will more than double the nation's refinery capacity. In addition, the existing 40,000-barrel-per-day refinery of Svenska Shell at Skarvik, Gothenburg, is slated for expansion to 80,000 barrels per day by mid-1966, thereby raising total throughput capacity for the country to nearly 200,000 barrels per day by the end of 1966.

The Mineral Industry of Switzerland

By Stephen C. Brown[1]

◆

SWITZERLAND'S trade deficit in minerals declined in significance as a factor in the total deficit on goods account during 1964, but the country continued to be highly dependent on foreign supplies. The aluminum industry, Switzerland's major producing mineral industry, increased output of primary aluminum by about 5 percent, while the output of secondary aluminum rose by 40 percent. The small iron and steel industry also increased output. Among the nonmetals, the cement industry recovered from the 1963 decline in output and increased production by over 20 percent. In its first full year of operation Switzerland's only petroleum refinery, an independent enterprise working in cooperation with the Italian firm Ente Nazionale Idrocarburi (ENI), experienced unsatisfactory business and was able to utilize only about one-third of its capacity, but completion of a large oil-fired thermal power plant nearby in late 1965 is expected to improve its operating rate.

The small Swiss mineral industry showed some signs of growth, primarily in the mineral processing field (aluminum and petroleum refining), but it may have done no better than to maintain its relative position in the economy as a whole. Swiss gross domestic product increased by 9.8 percent in 1964 as compared with 8.2 percent in 1963, and although no definite data on the value of production of the mineral industries are available, it appears unlikely that the mineral industry exceeded this rate of increase. The prospective opening of additional petroleum refineries in Switzerland within the next 2 years gives promise, however, of a substantial increase in the mineral industries' share of total output.

Similarly a change in Swiss energy policy occurring in 1964 indicates the probability of substantially larger mineral imports as the country shifts to increasing reliance on oil-fired thermal power plants and, eventually nuclear power.

GOVERNMENT POLICIES AND PROGRAMS

Effective January 1, 1964, tariffs on imports of manufactured goods from European Free Trade Area (EFTA) countries were reduced by 10 percent in accordance with the provision of the EFTA agreement; duties on goods from these countries were thus reduced to 40 percent of the levels prevailing before the EFTA agreement went into effect. The change was most significant for imports of metals and metal goods, specifically for aluminum, and resulted in domestic price reductions for the latter commodity.

---

[1] International economist, Division of International Activities.

Switzerland was a participant in the "Kennedy round" of the General Agreement on Tariffs and Trade negotiations that continued during the year and appeared likely to be affected by its outcome, both with respect to the commodities in which it has a major interest and with respect to other commodities of which it is not a major but still a significant supplier to the European Economic Community (EEC), one of the main economic blocks involved in the negotiations; some of these commodities are minerals or of mineral origin. The outcome of negotiations on aluminum is likely to be especially significant for Switzerland; the internal margins of preference on intra-EEC trade in aluminum semimanufactures have become quite large.

The major change in Switzerland's domestic mineral policy related to the energy field, and involved a shift from reliance almost entirely on hydroelectric power, which is expected to be fully exploited by 1970, to interim reliance on oil-fired thermal power plants and an eventual shift, for the future expansion of power supplies, to nuclear power. This new policy is said to be based not only on the impending exhaustion of hydroelectric potential but also on the increasing competitiveness of nuclear power, the desire to remain (so far as possible) independent of other countries for energy supplies, and the difficulty of storing conventional fuels in quantities sufficient to maintain power output in situations of emergency or interrupted supply. No legislation is involved, but the Swiss Government is encouraging utilities to construct thermal power plants and to plan for the introduction of nuclear power stations beginning about 1970 or 1971.

PRODUCTION

In the absence of official production statistics, coverage of Swiss output of minerals is incomplete, but available data indicate a substantial increase in the main items. Primary aluminum output increased by 5 percent in 1964, while output of crude steel and castings rose significantly, though still small. Pig iron and iron ore production both declined. Cement output, recovering from the 1963 decline, rose by 741,000 tons. Output of lime rose by 8 percent.

Detailed data are still not available for output of the only Swiss petroleum refinery, Raffineries du Rhone S.A., which went on stream in mid-1963. Official data for 1963 show 359,000 metric tons of crude imports, and Organization for Economic Co-operation and Development (OECD) data indicate a refinery throughput of 267,000 tons and refined production of 157,000 tons.[2] Total marketings in 1964 are reported at about 770,000 tons or about one-third of capacity.[3] Foreign trade statistics show 1964 imports of 6,347,000 barrels (838,000 tons) of crude, all of which presumably was destined for processing in the refinery.

---

[2] Erdoel und Kohle, v. 17, No. 12, December 1964, p. 1053.
[3] The Economist. July 3, 1965, p. 68.

Data are not available for the value of mineral production, but it almost certainly increased in 1964 as a result of the increases in output of Switzerland's existing mineral processing industries (aluminum, iron and steel, cement and lime) and the addition, for the first full year, of refined petroleum products output.

TABLE 1.—Switzerland: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1960	1961	1962	1963	1964
Metals:					
Aluminum	39,730	42,210	49,570	61,180	64,235
Copper, smelter	----------	1,800	800	----------	----------
Iron and steel:					
Iron ore thousand tons	125	86	104	96	90
Pig iron do	50	50	50	42	30
Ferroalloys (ferrosilicon) do	3	4	5	2	2
Ingots and other equivalent primary forms thousand tons	249	270	290	295	320
Castings do	15	16	16	15	25
Nonmetals:					
Cement thousand tons	3,036	3,601	3,726	3,581	4,322
Lime, hydraulic	168,016	185,666	192,601	184,426	200,041
Salt	149,311	157,277	167,943	[r] 190,716	181,571
Slate	737	751	450	458	422
Mineral fuels:					
Asphalt	15,414	13,229	[e] 13,000	[e] 13,000	3,571
Coke, gas plant	483,811	479,743	496,322	527,980	340,000
Tar and pitch, gas plant	29,019	27,729	27,505	29,367	NA
Gas, manufactured million cubic feet	12,289	12,155	12,717	12,357	NA

[e] Estimate. [r] Revised. NA Not available.

[1] In addition to commodities listed, unreported quantities of several metals, including copper, magnesium, nickel, and zinc were produced from scrap. Building stone, limestone for cement, crushed rock, gypsum, coal briquets, and peat were also produced, but output is not reported. Switzerland's first oil refinery went on stream in September 1963, but its output has not been reported.

TRADE

Switzerland's foreign trade in minerals, like its total foreign trade, is characterized by a heavy deficit, and the deficit on mineral trade typically has accounted for a large proportion of the total deficit on goods account. The deficit on mineral trade has remained fairly stable, however, while the total deficit has risen sharply. Total imports rose from $3,006 million in 1962 to $3,242 million in 1963 and $3,602 million in 1964, gains of 7.8 percent and 11 percent, respectively; while total exports rose from $2,218 million in 1962 to $2,420 million in 1963 and $2,656 million in 1964, gains of 9.1 percent and 9.8 percent.

By value, imports of metals and minerals rose from $618 million in 1962 to $658 million in 1963 and $668 million in 1964, increases of 6.5 percent in 1963 and of less than 1.5 percent in 1964. Exports of metals and minerals rose from $109 million in 1962 to $137 million in 1963 and $156 million in 1964, increases of 25 percent and 14 percent, respectively. As a percentage of total imports, mineral imports declined from 20.6 percent in 1962 to 20.3 percent in 1963 and 18.5 percent in 1964, while mineral exports rose from 4.9 percent of total exports in 1962 to 5.6 percent in 1963 and 5.9 percent in 1964. The deficit on mineral trade account, which was stabilized during the 3 years at the $510 million to $520 million level, thus declined from 64.5 percent of the total deficit on goods account in 1962 to a little over 54 percent of the total goods deficit in 1964. Mineral imports, however, remained more than four times the value of mineral exports.

The bulk of the mineral trade on both the import and export sides consists of processed and semimanufactured metals and minerals, though the opening of a petroleum refinery in 1963 for the first time resulted in the importation of significant quantities of crude oil. On the import side, the chief items by value remained iron and steel and semimanufactures thereof (34.6 percent of the total in 1964), crude petroleum and refined products (27.9 percent of the total in 1964), and nonferrous metals (aluminum, copper, lead, nickel, tin, and zinc) in all forms (13 percent of the total in 1964). A peculiarity of Swiss foreign trade in minerals is the high proportion of the total accounted for by trade in the precious metals (excluding monetary gold) and in precious and gem stones (including diamonds); in the 3 years 1962–64 they accounted for 8.5 to 10.5 percent by value of mineral imports, and for 45 to 47 percent by value of mineral exports.

The most significant changes in exports during 1963 and 1964 were sharp increases in exports of aluminum and aluminum semimanufactures, iron and steel semimanufactures, and refined petroleum products (much of which, in 1962 and 1963 at least, must have consisted of reexports). In 1964 exports of aluminum and semimanufactures accounted for 19.8 percent by value of total mineral exports (20.7 percent in 1963), while exports of iron and steel semimanufactures accounted for 15 percent by value of total mineral exports (14.5 percent in 1963 and 16 percent in 1962). Exports of petroleum products remained very small in terms of total mineral exports.

TABLE 2.—Switzerland: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1963
Metals:				
Aluminum:				
Bauxite	40	50	5	West Germany 30; Italy 20.
Alumina	59	62	120	West Germany 41; Italy 6; France 3.
Ingots, including scrap	8,563	18,178	19,167	West Germany 7,679; United Kingdom 3,583; Italy 2,992; Sweden 1,936.
Semimanufactures	15,281	17,112	20,229	Netherlands 2,069; Sweden 1,666; West Germany 1,347; United States 1,066; Austria 940.
Antimony	12	------	------	
Copper and copper alloys:				
Scrap	1,830	7,012	10,056	West Germany 5,004; Italy 1,218; Austria 386.
Unwrought	[r] 2,086	2,215	2,989	Italy 1,167; West Germany 1,032.
Semimanufactures	7,851	8,486	10,362	United States 3,481; Italy 1,519; Israel 619; Spain 468.
Gold and alloys:				
Bullion and other unwrought. thou. troy oz	272	344	497	West Germany 290; Austria 26; Denmark 9.
Semimanufactures do	34	37	63	Denmark 22; Italy 5; France 3.
Iron and steel:				
Iron ore	75,445	89,929	63,639	Mainly to West Germany.
Scrap	7,082	14,857	31,053	Italy 7,713; West Germany 4,477; France 1,716.
Pig iron [1]	999	1,085	505	West Germany 618; France 192; Italy 138.
Ferroalloys	9,073	14,135	15,328	West Germany 10,753; Italy 2,466; Austria 764.
Ingot steel and equivalent forms.	435	142	34	Italy 136.

See footnotes at end of table.

TABLE 2.—Switzerland: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1963
Metals—Continued				
Semimanufactures:				
Bars, rods, angles, shapes and sections.	7,855	13,843	11,134	West Germany 6,000; Italy 4,899; Austria 1,527.
Plates and sheets	416	869	981	West Germany 647.
Hoop and strip	1,181	1,131	1,129	Denmark 416; Italy 244; Austria 97; France 94.
Railway track material.	55	35	100	Austria 12; West Germany 11.
Wire	1,156	3,232	3,676	Italy 1,344; Belgium-Luxembourg 377; West Germany 308; France 275.
Tubes, pipes and fittings.	20,438	21,701	30,643	France 3,260; Italy 3,231; Austria 1,749; Netherlands 1,604; Denmark 1,328; Belgium-Luxembourg 1,079.
Rough castings and forgings.	1,596	105	104	West Germany 52; Austria 23.
Total semimanufactures.	32,697	40,916	47,767	
Lead:				
Scrap	2,415	3,460	7,041	Italy 3,434.
Unwrought	1	15	868	West Germany 12.
Semimanufactures	102	108	85	Belgium-Luxembourg 46; Austria 16; France 15; Sweden 12.
Magnesium, all forms	38	29	68	Netherlands 13; Austria 8; Spain 2.
Mercury 76-pound flasks	87	19	432	Various.
Molybdenum, all forms	2	1	4	Mainly to Austria, West Germany, Rumania, and Czechoslovakia.
Nickel:				
Matte, speiss, scrap	525	482	598	Italy 131; France 122; United Kingdom 76; West Germany 75.
Anodes	283	321	265	France 180; West Germany 78; Sweden 20; Belgium-Luxembourg 15.
Semimanufactures	403	467	521	Netherlands 109; Israel 99; Italy 98; France 40.
Platinum group metals, all forms thous. troy oz	38	42	69	Italy 16; Belgium-Luxembourg 6; France 6.
Silver and alloys:				
Ingots, bars, etc do	422	470	211	West Germany 257; France 178.
Semimanufactures do	2,794	3,604	3,621	Italy 1,240; West Germany 641; Denmark 482.
Silicon metal	2,939	2,263	3,083	N.A.
Tantalum, all forms. kilograms	^{r}2,742	1,688	1,934	Poland 385; Sweden 315; U.S.S.R. 248; Finland 199; Czechoslovakia 115.
Tin:				
Scrap long tons	195	165	132	West Germany 69; Netherlands 65; France 31.
Unwrought and semimanufactures. do	^{r}47	54	59	West Germany 27; Austria 14; Netherlands 4.
Tungsten, all forms	2	14	23	West Germany 13.
Zinc:				
Scrap	1,012	1,017	978	Italy 955; Belgium-Luxembourg 34.
Slab	91	112	301	Italy 105; West Germany 4.
Semimanufactures	76	38	67	Austria 16; West Germany 5; Netherlands 3; Belgium-Luxembourg 2.
Other ores and concentrates	673	416	59	All to West Germany.
Other base metals	15	5	9	Mainly to West Germany and the Netherlands.
Scrap and ash of precious metals. thousand troy ounces	3,274	5,117	3,599	West Germany 2,608; Belgium-Luxembourg 1,671; France 586.

See footnotes at end of table.

TABLE 2.—Switzerland: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1963
Nonmetals:				
Abrasives, natural	26	5	4	Various.
Asbestos	21	101	58	Italy 41; West Germany 20; Sweden 13; Belgium-Luxembourg 8.
Cement	20,630	64,675	45,845	West Germany 55,170; France 9,356.
Chalk	18	9	27	Mainly to France.
Clays	12,667	4,718	6,921	West Germany 3,883; Austria 788.
Precious and gem stones. thousand carats	15,130	16,775	17,705	West Germany 4,610; United Kingdom 3,705; India 2,310; France 1,135.
Diatomite and other siliceous earths.	152	24	75	Austria 18; West Germany 6.
Dolomite	160	180	165	Netherlands 105; Belgium-Luxembourg 28; Norway 15.
Feldspar, leucite, etc	58	6	34	All to Italy.
Fertilizers and fertilizer raw materials:				
Nitrogenous	346	2	52	Various.
Phosphatic	3	----------	20	
Potassic: Potash	12	2	1	France 1.
Other	250	43	28	West Germany 41; France 2.
Gypsum	73	76	150	Italy 33; West Germany 10; France 3.
Lime	3,327	1,987	2,604	France 946; Austria 773; West Germany 267.
Limestone, industrial	2,291	----------	5	
Magnesite	24	9	13	France 8.
Mica	20	20	12	West Germany 4; Italy 4; United Kingdom 2; Belgium-Luxembourg 1.
Quartz and quartzite	6,615	14,964	21,924	Italy 11,713; West Germany 1,181; Belgium-Luxembourg 829.
Sand, gravel, crushed rock. thousand tons	63	72	76	West Germany 36; Austria 28; France 5; Italy 2.
Shale	451	458	423	West Germany 373; France 77; Belgium-Luxembourg 7.
Stone, not elsewhere specified	22,590	22,137	24,975	West Germany 17,259.
Talc and steatite	1,108	1,531	1,276	Italy 1,505; France 10; West Germany 7.
Other	20	2,613	3,374	West Germany 2,610.
Minerals fuels:				
Coal:				
Anthracite and bituminous.	1,774	302	800	France 301.
Lignite, including briquets.	167	354	94	West Germany 346.
Peat	202	273	84	West Germany 21; various [r]252.
Coke	394	133	60	Italy 116; West Germany 12.
Tar, coal and mineral	99	170	51	Mainly to West Germany.
Petroleum refinery products:				
Gasoline thous. 42-gal. bbls	----------	5	100	All to Austria.
Kerosine do	----------	----------	----------	
Distillate fuel oil do	----------	----------	21	
Residual fuel oil do	----------	6	421	All to West Germany.
Lubricants do	8	3	10	Italy 1; Colombia 1.
Liquefied petroleum gases. do	----------	----------	----------	
Asphalt do	14	2	----------	West Germany 1.
Petroleum coke do	47	87	100	West Germany 49; France [r]36.
Other do	----------	1	----------	
Carbon black	628	411	400	Italy 273; Mexico 45; France [r]25; United Arab Republic 20.
Natural asphalt and bitumen	2,007	1,732	3,571	United Kingdom 1,710.
Bituminous mixtures	299	299	368	West Germany 204.

[r] Revised.

[1] Includes sponge iron, shot, and grit.

TABLE 3.—Switzerland: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Metals:				
Aluminum:				
Bauxite	1,369	1,463	2,594	Italy 1,065; France 291; United Kingdom 63.
Alumina	107,116	124,776	120,673	France 69,511; British Guiana 45,165; Italy 7,643.
Ingots, including scrap	11,113	4,561	5,965	Austria 1,109; Norway 701; France 613; Canada 603.
Semimanufactures	7,744	8,844	8,158	West Germany 6,970; Netherlands 690; France 362; United Kingdom 249.
Antimony	546	317	355	Mainland China 249; U.S.S.R. 58; France 10.
Arsenic, white	100	91	99	France 30; Sweden 25; West Germany 16.
Beryllium	1	1	1	United States 1.
Copper and alloys:				
Scrap	432	226	301	Israel 113; United Kingdom 56; Austria 43.
Unwrought	[r] 42,422	39,058	38,703	Belgium-Luxembourg 12,791; Fed. of Rhodesia and Nyasaland 10,979; United States 4,053.
Semimanufactures	[r] 21,462	16,515	20,772	West Germany 6,030; Canada 4,171; United Kingdom 2,022; Belgium-Luxembourg 869.
Gold and alloys:				
Bullion and thou. troy oz other unwrought.	80	62	163	West Germany 51; France 5; Denmark 3.
Semimanufactures do	132	126	130	West Germany 62; United States 43.
Iron and steel:				
Iron ore	1,330	3,728	1,990	Italy 2,522; West Germany 784; Brazil 375.
Scrap	38,508	11,174	5,392	West Germany 9,336; Austria 1,694; France 86; Italy 52.
Pig iron [1]	87,128	68,609	57,420	West Germany 29,643; Netherlands 11,224; United Kingdom 7,475.
Ferroalloys	9,264	13,228	13,003	West Germany 4,015; U.S.S.R. 2,900; France 1,461.
Ingot steel and equivalent forms.	282,709	304,729	220,492	West Germany 219,034; France 37,704; Italy 34,592.
Semimanufactures:				
Coils for rerolling	1,282	2,059	2,618	West Germany 1,203; France 437; Belgium-Luxembourg 419.
Wire rod	50,118	60,199	67,858	France 34,734; Austria 14,179; West Germany 8,685.
Other bars and rods	147,912	142,895	139,266	West Germany 60,977; France 44,579; Belgium-Luxembourg 15,357; Austria 11,386.
Angles, shapes and sections.	203,566	277,360	211,203	West Germany 91,265; Belgium-Luxembourg 80,767; France 80,049; Austria 22,498.
Plates and sheets	392,427	425,261	458,888	West Germany 140,747; France 115,450; Austria 45,656; Belgium-Luxembourg 41,217.
Hoop and strip	102,288	93,410	121,345	France 29,333; West Germany 21,575; Austria 20,961; Belgium-Luxembourg 18,391.
Railway track material.	66,293	72,894	51,502	West Germany 24,104; Austria 22,738; Belgium-Luxembourg 15,911; France 9,955.
Wire	17,780	19,843	21,001	West Germany 10,495; Austria 3,280; Sweden 1,483; France 1,473; Belgium-Luxembourg 1,172.
Tubes, pipes and fittings.	127,810	128,619	145,496	West Germany 75,202; France 29,217; Italy 11,930; Belgium-Luxembourg 4,371.
Rough castings and forgings.	NA	3,630	3,023	West Germany 2,077; Belgium-Luxembourg 1,058.
Total semimanufactures.	[2] 1,109,476	1,226,170	1,222,200	

See footnotes at end of table.

TABLE 3.—Switzerland: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Metals—Continued				
Lead:				
Pig (including scrap)	24,119	19,847	21,413	Mexico 4,623; Australia 3,524; France 3,320; Peru 2,158.
Semimanufactures	688	571	446	West Germany 368; Belgium-Luxembourg 26; Austria 70; United Kingdom 47.
Magnesium, all forms	715	601	773	Norway 446; United Kingdom 48; Italy 40; United States 22.
Mercury 76-pound flasks	1,073	1,254	1,563	Spain 395; Italy 370; China 231; Mexico 50.
Molybdenum	13	8	20	Austria 3; West Germany 3; United Kingdom 2.
Nickel:				
Matte, speiss, etc	1,476	1,035	1,338	United Kingdom 701; Norway 196; France 65; Finland 58.
Scrap	141	67		Israel 67.
Anodes	224	158	133	United Kingdom 84; Norway 31; Finland 18; France 14.
Semimanufactures	531	489	619	United Kingdom 259; West Germany 181; Canada 41; France 40; Sweden 39.
Platinum-group metals, all forms thousand troy ounces	39	42	60	U.S.S.R. 23; West Germany 8; France 5.
Silver and alloys:				
Ingots, bars, etc do	6,122	10,266	11,175	Mexico 2,886; United Kingdom 1,937; United States 1,531; Peru 1,277.
Semimanufactures do	[r] 1,355	1,720	1,920	West Germany 1,531.
Silicon, metal	866	1,032	675	Sweden 564; Italy 110.
Tantalum, all forms kilograms	[r] 3,516	2,883	3,495	United States 1,584; West Germany 910; Sweden 191.
Tin:				
Ingots long tons	1,091	1,002	727	Malaysia 399; Netherlands 278; United Kingdom 75.
Semimanufactures do	88	87	90	Netherlands 30; Belgium-Luxembourg 21; West Germany 16; France 9; Denmark 7.
Tungsten, all forms	29	35	24	West Germany 27; France 4; United States 2.
Zinc:				
Slab, including scrap	[r] 30,350	20,404	20,567	Belgium-Luxembourg 9,055; West Germany 2,231; Congo (Léopoldville) 2,001; Mexico 1,606.
Semimanufactures	3,066	3,608	3,175	Belgium-Luxembourg 2,040; West Germany 685; Yugoslavia 320; Italy 229.
Other ores and concentrates	[r] 4,638	5,366	10,093	Australia 2,212; Turkey 1,475 West Germany 540.
Other base metals	409	202	622	Belgium-Luxembourg 50; West Germany 44; United Kingdom 28; United States 26.
Scrap and ash of precious metals thousand troy ounces	195	229	384	Denmark 204; Belgium-Luxembourg 21.
Nonmetals:				
Abrasives, natural	18,769	15,305	7,868	Italy 11,733; West Germany 3,362.
Asbestos	12,122	11,370	12,528	Canada 7,659; Fed. of Rhodesia and Nyasaland 1,434; South Africa 678.
Barite	2,509	1,951	2,021	West Germany 1,174; France 550; Italy 168.
Boron salts	137	157	210	United States 155; Turkey 2.
Cement	150,921	59,742	132,087	Italy 28,482; France 14,900.
Chalk	12,472	12,958	12,565	France 11,704; Italy 1,027.
Clays	158,059	161,343	161,989	West Germany 74,083; United Kingdom 42,104; France 20,086; Czechoslovakia 11,514.
Cryolite and chiolite	1,237	838	229	Mainly from Denmark.

See footnotes at end of table.

TABLE 3.—Switzerland: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Nonmetals—Continued				
Precious and gem stones. thousand carats	33,435	28,585	60,220	West Germany 10,255; Madagascar 3,945; Italy 3,700; Brazil 2,780.
Diatomite and other siliceous earths.	3,127	2,378	1,933	United States 1,278; France 385; West Germany 336.
Dolomite	8,241	7,902	9,012	Italy 3,753; France 2,278; West Germany 1,210.
Feldspar, leucite, etc	11,116	12,384	12,734	France 3,594; West Germany 3,458; Italy 2,665; Norway 1,218.
Fertilizers and fertilizer raw materials:				
Nitrogenous:				
Natural nitrates	76	96	46	West Germany 68.
Ammonium and calcium nitrates.	257	5,351	268	France 3,388; West Germany 1,517; Italy 286.
Ammonium sulfate	616	509	694	West Germany 359; Italy 90; Austria 60.
Calcium cyanamid	180	15	1	NA.
Other nitrogenous	13	46	------------	NA.
Phosphatic:				
Phosphate rock	31,132	34,567	36,571	Morocco 24,830; Belgium-Luxembourg 2,860; West Germany 1,713; Senegal 1,608; United States 1,386.
Thomas slag	179,499	183,700	192,632	France 118,156; Belgium-Luxembourg 65,525.
Other phosphatic	12,802	12,501	14,704	France 6,489; Netherlands 3,565; Belgium-Luxembourg 2,420.
Potassic:				
Potash	103,064	105,782	110,313	France 73,513; West Germany 31,300; Belgium-Luxembourg 969.
Other, not elsewhere specified.	11,751	13,732	17,038	France 7,983; West Germany 2,941; Italy 2,234.
Graphite, natural	657	669	561	Austria 381; West Germany 223; United Kingdom 20.
Gypsum	22,577	26,280	32,230	West Germany 11,545; Austria 6,767; Italy 4,447; France 3,493
Lime	3,342	4,102	5,265	Italy 4,050; West Germany 23; France 18.
Limestone, industrial	47,206	44,846	52,838	France 43,650; Austria 336; West Germany 232.
Magnesite	3,997	3,619	4,310	Austria 3,423; West Germany 79; Yugoslavia 74.
Mica	926	920	689	India 477; West Germany 230; United Kingdom 109.
Pigments, natural	383	399	343	France 144; West Germany 96; Austria 85; Italy 48.
Pyrites	35,003	37,324	31,918	Italy 37,313.
Quartz and quartzite	8,353	6,595	10,285	West Germany 4,661; Italy 1,541; Norway 96; Sweden 67.
Salt	787	2,831	838	West Germany 1,635; France 1,136.
Sand, gravel, crushed rock. thousand tons	3,461	3,471	4,146	France 1,536; West Germany 1,095; Italy 577; Austria 131.
Shale	1,766	2,053	2,530	West Germany 1,818; Italy 136; France 11.
Stone, not elsewhere specified	58,595	66,252	80,302	Italy 37,447; France 18,397; West Germany 6,571; Yugoslavia 868.
Sulfur	62,703	64,801	53,167	United States 37,617; France 25,148; Netherlands 1,045; West Germany 847.
Talc and steatite	15,977	15,430	13,308	France 9,024; Austria 3,337; Italy 1,331.

See footnotes at end of table.

TABLE 3.—Switzerland: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Mineral fuels:				
Coal:				
Anthracite and bituminous, including briquets thousand tons	1,731	2,055	1,409	West Germany 836; United States 449; France 231; Poland 215; Belgium-Luxembourg 212.
Lignite, including briquets thousand tons	186	217	190	West Germany 208; East Germany 9.
Peat thousand tons	26	24	26	Mainly from West Germany.
Coke do	525	692	491	West Germany 511; Netherlands 115; Italy 28, France 24
Tar, coal and mineral. do	10	10	15	West Germany 5; France 5.
Petroleum:				
Crude, including shale oil thousand 42-gallon barrels	------------	2,699	6,347	Libya 1,613; Saudi Arabia 665.
Refinery products:				
Gasoline do	8,995	10,823	11,006	West Germany 3,916; Italy 3,279; France 2,708.
Kerosine do	129	156	128	Netherlands 59; Italy 48.
Distillate fuel oils. do	2,262	3,748	4,121	Italy 1,593; West Germany 644; France 632.
Residual fuel oils. do	22,351	28,372	26,429	Italy 9,685; West Germany 7,280; France 5,035; Belgium-Luxembourg 2,919.
Lubricants do	489	552	523	United States 147; United Kingdom 103; Netherlands 71.
Liquefied petroleum gases. do	10	100	132	Italy 39; France 30; Netherlands 23.
Asphalt do	30	29	32	West Germany 11; United States 5.
Petroleum coke. do	201	364		West Germany 209; United States 155.
Wax and petrolatum. do	52	54	60	United States 20; West Germany 17.
Other do	1,042	1,429	1,881	West Germany 412; France 346; Netherlands 294.
Carbon black	5,758	5,775	6,549	West Germany 1,601; France 1,099; Italy 1,085; Netherlands 546.
Natural asphalt and bitumens.	704	764	911	Trinidad 506; United States 298.
Bituminous mixtures	4,908	4,728	5,326	West Germany 1,806; France 909; Italy 902; United States 729.

[r] Revised. NA Not available.

[1] Includes sponge iron, shot, grit, and pellets.

[2] Excluding castings and forgings.

COMMODITY REVIEW

METALS

Aluminum.—Primary aluminum producers worked practically at capacity in 1964, and capacity in semimanufactures was further expanded by the addition of a new extrusion and drawing mill at Reinach (Canton of Aargau) by Aluminum AG Menziken, which increased the number of extrusion mills in Switzerland to 27 and raised the share of extrusion products to 40 percent of total semimanufactured output. Secondary production rose sharply from 10,000 tons in 1963 to 14,000 tons in 1964, after increasing by nearly 65 percent over 1962 levels. This rate of increase in secondary production is the largest in western Europe, where a quite general increase in secondary production has been attributed to the high rate of output of the automobile industry.

Domestic consumption of ingot aluminum in 1964 is estimated at about 57,000 tons, including about 8,000 tons of secondary aluminum. Consumption of semimanufactures is estimated to have risen slightly to about 49,000 tons, including over 8,000 tons of imports, most of which are said to have consisted of intrafirm deliveries.[4]

Domestic prices of aluminum were reduced for the first time in 7 years, a change occasioned by the 10 percent tariff reduction on January 1, 1964, under the terms of the EFTA agreement. Ingot prices were reduced from 2.50 Swiss francs to 2.30 Swiss francs per kilogram, equalling the international price of 24 cents per pound. The reduction in semifinished prices varied, with prices of products whose principal cost component is labor declining less than those for which the principal cost element is metal.[5]

NONMETALS

Cement.—Both production and imports of cement increased substantially in 1964, while exports declined, supply and apparent consumption increasing by 822,157 tons. The increase in production alone accounted for nearly 741,000 tons, a 20.7 percent increase over 1963 output. This sharp recovery of the cement industry from the 1963 level of output is probably to be attributed to an 18.6 percent rise in output of the construction industry, despite measures taken by the authorities to regulate new construction.

Fertilizer Materials.—Although data are not available for production of chemical fertilizers, a sharp increase in exports of ammonium sulfate appears to indicate growing output.

MINERAL FUELS

Nuclear Power.—In a major development in the field of energy policy, the head of the Swiss Federal Council's Department of Energy and Communications announced that the principal aims of policy were to supply the country as cheaply as possible with energy, to ensure an independent energy supply in sufficient quantities, and to protect water and air from pollution; a study undertaken by his department in April 1964 had indicated that the early application of nuclear energy would best meet these requirements. An earlier study by the 10 principal Swiss power enterprises had suggested the continued exploitation of hydropower so long as economically justified, a shift to thermal power as an interim solution to meet growing needs, and plans to move to nuclear power from 1970 onward. Economic hydroelectric potentialities are expected to be fully developed by that date.

During the year plans were announced for the construction of three commercial nuclear power plants. The first, a 300-megawatt plant to be constructed at Beznau in the Canton of Aargau, is planned by Nordostschweizerische Kraftwerke A.G.; reactors of American design are to be used, and the plant is expected to be ready about 1969 or 1970. Two other plants, of about 250 megawatts capacity each, were announced by Bernische Kraftwerke A.G.; they are expected to be ready at a somewhat later date. One of these is to be at Mühleberg, near Bern, and the other at Darligen, on the south shore of Lake Thun; the first plant is expected to be in operation by 1971. Meanwhile the Swiss Federal Government is aiding a private established company, National Society for the Advancement of Industrial Atomic Technology (NGA), in the construction of a 7-megawatt experimental power reactor at Lucens, near Lausanne, which according to plans will be capable of expansion. Designs have been supplied by the Swiss Institute for Reactor Investigation at Würenlingen. This reactor is expected to be in operation by early 1966.

---

[4] Aluminum, January 1965, pp. 26–27.
[5] Schweizer Aluminum Rundschau. September 1964, pp. 207–209.

These shifts in Swiss energy policies can be expected to increase Swiss imports of mineral fuels in the future. In 1962 Swiss energy needs were covered as follows: Petroleum, 52 percent; hydroelectric power, 24 percent; coal and gas, 20 percent; and wood, 4 percent.[6]

Petroleum.—Switzerland's first oil refinery, Raffineries du Rhône at Collombey-Muraz, reported a loss of $2.1 million for 1964, its first full year of operations. Provisions for amortization, which were omitted from the accounts, would have approximately doubled this loss, according to reports.[7] The refinery, an independent enterprise working in association with the Italian firm ENI and supplied with crude by a Genoa-Collombey pipeline, is said to have been affected by lack of adequate marketing facilities as well as by a fall in product prices in 1964. Total marketings of the refinery were reported to be about 770,000 tons in 1964 (about one-third of capacity), but according to trade reports its share of the market for fuel oil was considerably higher. The completion of an oil-fired thermal power plant of 150 megawatts at nearby Vouvray, scheduled for late 1965, is expected to increase the refinery's sales.[8]

The 2,500,000-ton-per-year refinery of Shell at Neuchatel is scheduled for completion about mid-1965, while the proposed 4,500,000-ton-per-year refinery to be jointly owned by Esso, British Petroleum Co. Ltd., and other international companies, probably to be located at Lucerne, is not expected to be ready until early 1967. The latter project met opposition from the cantonal authorities of Aargau, the first choice as a site, and its sponsors were forced to seek another location. Meanwhile a new Swiss-controlled company, Raffinerie Rheintal A.G., planned to build another refinery at Sennwald in the Canton of St. Gallen, to be supplied with crude by the Genoa-Ingolstadt pipeline. It is not known when construction of the two latter refineries is to begin.

Explorations for petroleum continued in 1964, without success. A test boring at Pfaffnau near Lucerne by Luzernische Erdoel A.G. discovered natural gas at depths of 1,100 to 1,300 meters in encouraging but apparently not commercial quantities.

SOURCE MATERIALS

Production statistics are from Statistisches Jahrbuch der Schweiz (Annuaire Statistique de la Suisse) published by the Federal Bureau of Statistics, and from trade estimates as reported by the U.S. Embassy, Bern. Data for 1964 are estimates. Trade statistics are from the official customs statistics (Jahresstatistik des Aussenhandels der Schweiz/Statistique Annuelle du Commerce Extérieure del a Suisse) published by the Direction Générale des Douanes, Berne. Other information is from reports of the U.S. Embassy, Bern, and from trade journals and other publications.

---

[6] Societé de Banque Suisse. Changements structurels dans l'économie énergetique de la Suisse. Bull. 3, June 1964.
[7] The Economist, July 3, 1965, p. 68.
[8] Petroleum Press Service. V. 31, No. 7, July 1964, p. 269.

The Mineral Industry of the U.S.S.R.

By Roman V. Sondermayer[1]

◆

MINERAL and metal output in the Soviet Union increased in quantity and in variety during 1964, but the rate of increase was lower than in previous years and some production targets were not met. Exploration lagged behind targets, particularly for mineral fuels. Productivity remained far below Western standards according to Soviet sources, which have cited too rigid centralized planning, poor organization of material deliveries, and excessive waste through industrial inefficiency among causes for the low productivity.

Soviet approximate share of world output of selected mineral commodities in 1964 was as follows: Iron ore 25.4 percent; pig iron 19.7 percent; steel 19.5 percent; cement 16.00 percent; coal 20.1 percent; metallurgical coke 22.8 percent; other types of coke 7.9 percent; crude petroleum 15.9 percent.[2]

Commercially significant Soviet mineral exports to the free world were limited to crude oil, manganese, chromite, fertilizers, and precious metals. Many Soviet mineral products were not competitive in the open market because of quality. For the European Communist countries, however, Soviet mineral exports were vital.

In 1964, the mineral and metal industry contributed 36 billion rubles or 8 percent of the gross national product (GNP) of the U.S.S.R. and was an important earner of foreign exchange. Out of 20.5 million workers in all industries, 4 million were in the mineral and metallurgical industry. Nonmetal producers employed the greatest number of workers, followed by the coal, metals, and petroleum industries in that order. Soviet mineral trade was characterized by the export of crude materials and the import of semimanufactured products. Crude petroleum, iron ore, pig iron, and steel ingots were the largest export items. Nonferrous semimanufactures mostly made from copper, lead, and zinc were the leading imports.

Important developments were reported in all major sectors of the Soviet mineral industry—metals, nonmetals, and mineral fuels. Two alumina plants commissioned in Siberia—at Krasnoyarsk and Pavlovdar—will make increased production of aluminum feasible in the near future. The discovery of large nickel-copper deposits in the Norilsk area was significant. Confirmation of extensive iron ore reserves in

---

[1] Foreign mineral specialist, Division of International Activities.

[2] Percentages are shown only for those commodities for which official Soviet figures have been reported.

Central Siberia and the commissioning of the first blast furnace of the Western Siberia Iron and Steel Works at Novokuznetsk were other developments indicating the continuing eastern shift of Soviet industry.

The nonmetal industry had a year of moderate expansion marked with events that will make future production increases in several commodities possible. Highlights of the nonmetal industry included commissioning of asbestos plants in the Tuva Region and in the Urals, bentonite plants in Armenia and Kazakhstan, cement plants in Azerbaidzhan and Lithuania, mines and concentrators for apatite on the Kola Peninsula, four mines and plants for potash at Beresniki and Soligorsk, and several refractory plants.

Completion of a pipeline system connecting Irkutsk in Siberia with the western border of the U.S.S.R., expansion of the Mangyshalk oil and gas area, and discoveries of new fields in western Siberia, Belorussia, and Tashkent were the principal developments in crude petroleum production and transport.

Although the contribution of coal has been declining in recent years, it remained the main source of energy in the U.S.S.R. during 1964, providing 46 percent of total energy production. New coal deposits were discovered, in western Donbas, at Karaganda basin in Kazakhstan, and at Kamsk-Achinsk basin in Siberia. Shortages of energy and fuels continued to hamper overall mineral development. A special meeting of the Central Committee was held in mid-1964 to consider the problem of fuel and energy shortage. As a result, a campaign for greater efficiency in energy and fuel consumption was undertaken by the Soviet press. Soviet authorities also campaigned to improve the quality of mineral and metal products as well as semimanufactured articles, one of a number of long-standing problems in the Soviet mineral economy.

GOVERNMENT POLICIES AND PROGRAMS

The U.S.S.R. plan for 1965, as accepted by the Supreme Soviet, was announced late in 1964. Output targets were higher and investment policy was shifted back toward heavy industry. The significant increase in mineral output planned for 1965 will put considerable stress on equipment and facilities.

The planned target for power calls for a 12.5 percent higher output than in 1964 when production was 459 million kilowatt hours. To achieve this plan new facilities totaling 11 million kilowatts were to be commissioned. The plan also calls for more efficient power consumption. Industrial consumption of electric power per unit of industrial production was to be reduced by 1.5 percent in 1965.

Output of chemical fertilizers was planned to be increased by 31 percent, insecticides by 38 percent, plastics by 28 percent, and synthetic fiber by 16 percent, as part of a program to increase total chemical output by 15 percent. New plants will increase the annual capacities of mineral fertilizers by 5.5 million tons, sulfuric acid by 1.7 million tons, and synthetic fiber by 105,000 tons. Planned chemical industry investments were drastically slashed. Instead of the 32-percent increase for 1965 as announced early in 1964, a 13-percent increase was subsequently planned—a significant cut directed by the new leadership in the U.S.S.R.

Development of the fuel industry was lagging behind the goals set by the 7-year plan (1959–65). To meet overall targets, the 1965 plan calls for crude oil production of 242 million tons, total coal output of 559 million tons, and gas production of 128.3 billion cubic meters. A total of 4,464 kilometers of new pipelines will be commissioned, including the second trunk of the Bukhara-Urals gas pipeline. The largest share of mineral fuel industry investments in 1965 will be in the coal sector, where a 14-percent increase over that of 1964 was expected.

Planned 1965 iron and steel targets were 65.7 million tons of pig iron, 90 million tons of steel ingots, and 69.6 million tons of rolled products. A 14-percent increase in 1965 investments in the iron and steel industry was scheduled.

Targets for nonferrous metals were not disclosed, but general statements indicate that the overall increase will be 10 to 20 percent over production in 1964. Cement production will increase 8 percent over the 1964 level.

PRODUCTION

Soviet mineral statistics were kept secret in most cases, therefore many of the data in production tables were estimated. Some estimates are reasonably sound but many denote no more than an order of magnitude. During 1964 about half of the increased output of the mineral and metallurgical industry was achieved by more efficient use of available facilities rather than by the establishment of new ones. Opencast mining was used more widely.

Strip mining with mass production was used in coal mines of Siberia and reports indicate low costs of production.

Turbodrilling was the most preferred method of drilling for gas and oil, and about 70 percent of the wells were drilled by that method.

Crude oil production came from flowing and pumping wells.

TABLE 1.—U.S.S.R.: Estimated[1] production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [2]	1960	1961	1962	1963	1964 [p]
Metals:					
Aluminum:					
Ores and concentrates:					
Bauxite, 26 to 52 percent alumina thousand tons	3,500	4,000	4,200	4,300	4,300
Nepheline concentrates 25 to 30 percent alumina thousand tons	200	350	375	400	500
Alunites ores, 16 to 18 percent alumina do	------	------	------	30	40
Metal [3] do	r 640	r 890	r 900	960	1,000
Antimony, content of ore	5,700	5,700	6.000	6,100	6,100
Arsenic, white (As_2O_3)	5,500	6,000	6,500	6.500	6,500
Beryl, cobbed, only 10 to 12 percent BeO	650	800	900	1,000	1,000
Bismuth	20	30	30	30	30
Cadmium	1,400	r 1,500	r 1,600	r 1,700	1,800
Chromite ore, 30 to 55 percent Cr_2O_3 thousand tons	915	920	1,150	1,230	1,300
Cobalt	800	1,000	1,100	1,200	1,200
Copper:					
Ores, gross weight, 0.5 to 2 percent Cu thousand tons	40,000	46,000	54,000	59,000	60,000
Smelter [4]	500,000	550,000	650,000	700,000	r 750,000
Iron and steel:					
Iron ore, 55 to 63 percent Fe [5] thousand tons	105,857	117,633	r 128,111	137,475	146,000
Iron ore sinter [6] do	65,135	74,190	83,360	93,531	NA
Pig iron and ferroalloys:					
Pig iron for steelmaking [6] do	38,472	42,018	45,579	48,366	NA
Foundry pig iron [6] do	6,961	7,430	8,071	8,617	NA
Spiegeleisen [6] do	81	97	90	91	NA
Ferromanganese [6] do	643	699	812	821	NA
Other blast furnace ferroalloys [6] do	600	649	713	796	NA
Total [6] do	46,757	50,893	55,265	r 58,691	62,400
Steel:[6]					
Ingots do	60,300	65.532	70,880	74,411	NA
Steel for casting do	4,993	5,223	5,426	5,820	NA
Total do	65,293	70,755	76,306	r 80,231	85,000
Semimanufactures:					
Heavy sections do	13,771	14,443	15,155	15,549	NA
Light sections do	4,153	4,662	5,305	5,464	NA
Wire rods do	3,547	3,902	4,072	4,369	NA
Pipe stock do	2,775	2,925	3,176	3,458	NA
Tubes from ingots do	1,124	1,139	1,105	1,083	NA
Plates and sheets:					
More than 4.75 millimeters thick do	6,795	7,695	8,224	8,850	NA
Other do	5,313	5.925	6,721	7,460	NA
Subtotal plates and sheets do	12,108	13.620	14,945	16,310	NA
Strip do	2,756	3,166	3,633	4,128	NA
Railway track material do	3,158	3,194	3,404	3,278	NA
Wheels, tires and axles do	825	748	833	825	NA
Unspecified, for sale do	469	471	639	535	NA
Other do	120	192	120	122	NA
Total semimanufactures do	44,806	48,462	52,387	55,121	57,400
Selected end products:[7]					
Welded pipes and tubes do	2,539	2,963	3,341	3,770	NA
Seamless pipes and tubes do	3,266	3,394	3,537	3,751	NA
Total do	5,805	6,357	6,878	7,521	NA
Cold-rolled sheets do	1,533	1,703	1,815	2,155	NA
Tinplate do	312	330	351	368	NA
Galvanized sheets do	237	244	260	267	NA
Electrical sheets do	494	601	661	742	NA
Wire, plain do	1,193	1.381	1,584	1,759	NA
Lead smelter	r 320,000	r 350,000	r 350,000	r 350,000	360,000
Magnesium	25,000	31,000	32.000	32.000	32,000
Manganese ore [5] thousand tons	5,872	5,972	6,402	r 6,663	6,700
Mercury 76-pound flasks	25,000	25,000	35.000	35,000	35,000
Molybdenum	5,000	5,400	5,700	5,700	6.000
Nickel, smelter [4]	58,000	75,000	85,000	85,000	85,000
Platinum thousand troy ounces	330	500	800	800	1,000
Silver do	25,000	25,000	27,000	27,000	27,000
Tin, smelter [4] long tons	16,000	17,000	17,000	20,000	20,000
Titanium	1,000	3,000	4,000	5,000	5,000
Tungsten, concentrates, 60 percent WO_3 basis	9,500	10,000	10.500	11,000	11,000
Zinc:					
Recoverable metal content of domestic ores	375,000	400,000	410,000	410,000	410,000
Smelter [4]	395,000	425,000	465,000	465,000	460,000

See footnotes at end of table.

TABLE 1.—U.S.S.R.: Estimated[1] production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity[2]	1960	1961	1962	1963	1964[p]
Nonmetals:					
Asbestos……thousand tons	600	800	1,000	1,050	1,150
Barite	130,000	150,000	180,000	200,000	200,000
Boron minerals and compounds, B_2O_3 content	60,000	62.000	63.000	63,000	63,000
Cement……thousand tons	45,520	50,864	57,328	[r]61,018	64,900
China clay (kaolin)……do	1,100	1,300	1,400	1,500	1,500
Diamonds……thousand carats	950	1,500	2,500	3,000	3,000
Diatomite	275,000	300,000	300,000	[r]310,000	310,000
Feldspar	200,000	[r]200,000	[r]200,000	[r]200,000	200,000
Fertilizer materials:					
Crude:					
Nitrogen compounds, N content equivalent thousand tons	1,500	1,600	1,700	2,000	2,100
Phosphate:					
Apatite……do	4,700	5,600	6,600	7,000	8,000
Sedimentary rock……do	2,300	3,200	3,400	4.000	5,000
Total……do	7,000	8,800	10,000	11,000	13.000
Potash, K_2O equivalent……do	1,100	1,300	1,500	1.530	1,600
Manufactured:					
Nitrogenous, bulk[5]……do	4,892	5,664	6,905	8,575	NA
Phosphatic, bulk[5]……do	4,878	5,047	5,161	5,860	NA
Potassic, bulk[5]……do	2,606	2,753	3,198	3,365	NA
Others[5]……do	1,491	1,858	1,994	2.135	NA
Total[5]……do	13,867	15,322	17,258	19,935	25,600
Fluorspar	190,000	210,000	[r]240,000	[r]270,000	300,000
Graphite	45,000	50,000	55,000	55,000	55,000
Gypsum[5]	4,622	4,456	4,376	[r]4,239	4,300
Lime, dead burned[5]……thousand tons	16,140	[r]17,259	[r]16,559	[r]16,013	17,500
Magnesite……do	2,400	2,500	2,500	2,700	2,800
Pyrite, gross weight……do	2,800	2,800	3,000	3,200	3,200
Refractories:					
Shamotte[5]……do	4,940	5,174	5,427	5,600	5,800
Dinas (quartzite-lime)[5]……do	665	689	685	680	690
Magnesite and chrome magnesite[5]……do	1,050	1,115	1,195	1,200	1,200
Magnesite powder[5]……do	1,062	1,102	1,172	1,200	1,200
Total……do	7,717	8,080	8,479	8,680	8,890
Salt……do	6,700	7,500	8,550	8,750	8,800
Sulfur (excluding sulfur content of pyrite)……do	1,010	1,175	1,320	1,350	1,350
Mineral fuels:					
Coal:					
Brown[5]……do	138,261	133,516	130,976	136,590	NA
Hard:					
Coking[5]……do	110,198	112,247	117,462	127,063	134,000
Anthracite[5]……do	78,013	77,480	76,364	[r]76,683	NA
Undifferentiated……do	186,714	187,292	192,606	[r]191,383	NA
Subtotal[5]……do	374,925	377,019	386,432	395,129	NA
Total[5]……do	513,186	510,535	517,408	531,719	554,000
Coke[5]……do	56,233	58,604	60,929	63,876	NA
Crude oil[5]……do	147,859	166,068	186,244	206,070	224,000
Oil shale[5]……do	14,147	15,174	16,370	18,308	NA
Peat[5]	53,625	51,249	34,720	58,550	NA
Natural gas[5]……billion cubic feet	1,750	2,270	2,800	3,400	3,850
Electric power[5]……billion kilowatt hours	202	328	360	412	459

[p] Preliminary.
[r] Revised.
NA Not available.
[1] Estimated except where noted.
[2] In addition to commodities listed, the U.S.S.R. is known to produce gold, but no estimate of output is included.
[3] Excludes production from scrap.
[4] Includes production from scrap.
[5] Reported in Soviet sources.
[6] Data for 1960-63, United Nations Quarterly Bulletin of Steel Statistics for Europe, v. XV, No. 3—1965, p. A 23.
[7] Items listed under this heading are produced from semimanufactures listed above and possibly also from imported material. Therefore, these data are not additive to the total of semimanufactures listed.

TRADE

The Soviet Union remained a significant exporter of manganese ore, iron ore, chromite, aluminum, steel ingots, precious metals, crude petroleum and petroleum refinery products.

During 1963 total Soviet trade amounted to 12,897.7 million rubles, including 6,545.2 million rubles of exports and 6,352.7 million rubles of imports. Two-thirds of the Soviet trade was with Communist countries. Trade with the United States was minimal.

Mineral and metallurgical industrial products accounted for 30.9 percent of all exports. The principal exports were mineral fuels which amounted to 17.7 percent of the total. The principal countries of destination for Soviet mineral exports were East Germany, Czechoslovakia, and other Communist countries.

In Soviet imports, the share of the mineral and metallurgical commodities was 9.4 percent of the total. Iron and steel as well as nonferrous semimanufactures were the most important items.

TABLE 2.—U.S.S.R.: Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Ingots and equivalent primary forms.	115,700	122,100	East Germany 53,800; United Kingdom 18,700; Czechoslovakia 10,200; Rumania 8,600.
Semimanufactures, including those of duraluminum.	21,400	11,700	Cuba 3,700; East Germany 3,100; Bulgaria 1,600; Czechoslovakia 1,200; Poland 1,200.
Antimony, primary forms	3,900	1,897	Netherlands 700; West Germany 600; Belgium 500.
Cadmium, primary forms	1,100	1,000	Netherlands 300; East Germany 200; Czechoslovakia 159; Hungary 120; West Germany 100.
Chromite (48 to 56 percent Cr_2O_3)	472,000	567,000	United States 192,000; Japan 77,000; France 60,000; West Germany 51,000; Sweden 49,000; Czechoslovakia 44,000.
Cobalt, primary forms	200	200	Mainland China 15; Undisclosed 185.
Copper:			
Ingots and equivalent primary forms:			
Unalloyed	71,300	72,000	East Germany 33,000; Czechoslovakia 18,200; Poland 8,000; Hungary 6,400; Rumania 5,900.
Alloyed (bronze)	2,300	2,200	East Germany 1,700.
Semimanufactures:			
Unalloyed	5,500	5,500	Cuba 2,600; East Germany 800; Bulgaria 458, Czechoslovakia 454; Rumania 427.
Alloyed (copper-zinc)	6,500	6,000	Rumania 1,611; Bulgaria 987; Cuba 900; mainland China 475.
Iron and steel:			
Iron ore thousand tons	18,935	20,789	Czechoslovakia 6,914; Poland 6,432; East Germany 2,445; Hungary 2,032.
Pig iron do	2,274	2,538	Japan 809; East Germany 660; Bulgaria 133; Czechoslovakia 122; Rumania 90.
Ferrous scrap do	225	271	Finland 100.
Ferroalloys:			
Ferrosilicon	54,200	56,900	Rumania 35,000; Czechoslovakia 27,000; Hungary 21,000; United Kingdom 21,000; Finland 6,000.
Ferromanganese	55,700	58,900	
Ferrochromium	16,000	14,100	
Ferromolybdenum	[r]2,500	3,100	
Not specified	[r]19,000	20,000	
Total	147,400	153,000	
Semimanufactures:			
Rolled products, excluding pipes. thousand tons	[r]3,531	3,536	East Germany 1,356; Rumania 679.
Steel pipes do	248	221	East Germany 88; Rumania 29; Bulgaria 24; mainland China 24.

See footnotes at end of table.

TABLE 2.—U.S.S.R.: Exports of selected metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals—Continued			
Lead, ingots and equivalent primary forms.	94,400	110,200	East Germany 37,300; Czechoslovakia 13,100; Hungary 10,000; Finland 10,000; Netherlands 7,400; United Kingdom 6,200; India 5,000; Austria 4,300.
Magnesium, primary forms	1,600	2,100	NA.
Manganese:			
Metallurgical grade ore	963,000	986,000	Poland 242,000; East Germany 209,000; France 106,000; Czechoslovakia 104,000; United Kingdom 100,000; Japan 71,000; West Germany 65,000.
Battery and chemical ore	11,500	8,900	Netherlands 3,500; Poland 2,200; East Germany 1,000.
Mercury 76-pound flasks	17,400	14,500	East Germany 9,751; Hungary 1,305; Undisclosed 3,444.
Molybdenum, concentrate	100		
Tin, primary forms long tons	490	700	NA.
Tungsten, concentrate	4,200	3,740	West Germany 1,800; Austria 800; United Kingdom 700; France 440.
Zinc:			
Concentrate	19,400		
Ingots and equivalent primary forms.	108,000	82,400	East Germany 25,900; India 11,900; United Kingdom 11,700; Netherlands 10,000; Czechoslovakia 9,700.
Nonmetals:			
Abrasives:			
Hard alloys	147	185	Rumania 110; Poland 29; Hungary 23; Bulgaria 15.
Asbestos	176,800	180,100	West Germany 26,700; France 18,100; East Germany 17,600; Czechoslovakia 15,600; Japan 13,800; Poland 13,000; Hungary 12,400; Bulgaria 10,600.
Cement thousand tons	540	1,081	Ghana 195; Spain 139; Czechoslovakia 103; Turkey 100; Pakistan 77; Indonesia 76; Ceylon 63.
Cryolite	2,800	3,000	Rumania 2,000; Undisclosed 1,000.
Fertilizers and fertilizer raw material minerals:			
Apatite ore	142,900	81,400	Czechoslovakia 51,500; East Germany 16,500; West Germany 13,400.
Apatite concentrates, 84 to 86 percent $Ca_3P_2O_8$. thousand tons	2,242	2,222	East Germany 640; Poland 309; West Germany 234; Czechoslovakia 216; Hungary 165; Bulgaria 138; Finland 129; Norway 104.
Superphosphate, not less than 18.7 percent P_2O_5.	322,000	295,100	Hungary 86,100; Cuba 70,600; East Germany 53,500; Bulgaria 30,700.
Ammonium nitrate	77,000	159,300	Hungary 83,400; Bulgaria 27,400; Cuba 25,300; Afghanistan 8,400.
Ammonium sulfate	404,000	410,200	Cuba 186,500; North Viet-Nam 35,800; Italy 11,600; Australia 9,300; Undisclosed 158,200.
Potassium salts, KCl, 58 to 62 percent K_2O equivalent.	878,000	992,200	Japan 322,600; Yugoslavia 129,500; Finland 64,100; United Kingdom 58,200; Cuba 58,200; Italy 48,900; Netherlands 36,400.
Fluorspar	5,000	3,300	All to Japan.
Graphite	5,200	6,400	East Germany 2,600; Hungary 1,400; Bulgaria 1,200; Poland 600.
Gypsum	20,000	18,000	All to Finland.
Kaolin	400	3,200	NA.
Pyrite thousand tons	781	1,016	Italy 359; East Germany 177; United Kingdom 26.
Refractories:			
Clay, fire resistant	2,800	8,600	Hungary 1,600; Undisclosed 7,000.
Magnesite powder	13,400	13,000	Rumania 7,800; Japan 5,200.
Other	74,000	57,400	Bulgaria 26,400; Rumania 12,400; India 10,800; Cuba 3,500.
Salt	134,000	138,200	Czechoslovakia 57,400; Finland 30,300; Undisclosed 30,500.
Sulfur	169,100	103,700	Cuba 38,900; Czechoslovakia 20,700; Hungary 16,600; Austria 10,200; Finland 9,600.
Sulfuric acid	57,600	77,400	Czechoslovakia 46,000; Hungary 30,200.
Talc	10.000	14,600	All to Japan.

See footnotes at end of table.

TABLE 2.—U.S.S.R.: Exports of selected metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Mineral fuels:			
Coal:			
Anthracite thousand tons	3,265	4,235	France 1,804; Belgium 553; Italy 444; East Germany 292; Finland 274; Netherlands 211; Czechoslovakia 201.
Bituminous do	15,893	16,785	East Germany 5,546; Czechoslovakia 2,574; Bulgaria 1,283; Yugoslavia 933; Hungary 926; Austria 893.
Other do	192	342	Czechoslovakia 283.
Total do	19,350	21,362	
Coke do	3,322	3,796	East Germany 1,511; Hungary 636; Rumania 618; Denmark 257; Finland 252; Sweden 204; Bulgaria 139.
Petroleum:			
Crude do	26,279	30,243	Italy 6,727; Czechoslovakia 4,222; Cuba 3,766; East Germany 3,060; West Germany 2,215; Japan 2,026.
Refinery products:			
Gasoline thousand tons	3,155	3,342	Poland 891; mainland China 455; Bulgaria 408.
Kerosine do	1,295	1,269	India 301; Czechoslovakia 261; Poland 86.
Gas/diesel oil do	6,387	7,488	Finland 1,308; West Germany 899; Poland 640; Sweden 542.
Residual fuel oil do	7,737	8,576	Sweden 2,466; Italy 981; Bulgaria 747; Greece 615.
Lubricants do	439	387	Mainland China 141; Cuba 52; North Korea 40; Bulgaria 37.
Bitumen do	22	19	Bulgaria 15.
Paraffin do	30	29	Poland 11; mainland China 2; Bulgaria 2; Cuba 2.
Unidentified do	39	29	All to Communist countries.
Total do	19,104	21,139	Sweden 3,030; Poland 2,215; Finland 1,812; Bulgaria 1,636; mainland China 1,408.
Carbon black	r 5,575	9,506	Czechoslovakia 2,100; Bulgaria 1,200.

r Revised.
NA Not available.

TABLE 3.—U.S.S.R.: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Bauxite	308,300	441,300	All from Greece.
Semimanufactures, including those of duraluminum.	3,800	6,400	NA.
Antimony	--------	2,000	All from mainland China.
Cadmium, primary forms	[r]334	259	Poland 200.
Copper:			
Ingots and equivalent primary forms:			
Unalloyed	106,400	88,000	West Germany 27,200; Rhodesia 24,800; Belgium 19,500; Sweden 9,800; United Kingdom 2,300.
Semimanufactures	--------	12,300	All from Yugoslavia.
Iron and steel:			
Pig iron.......thousand tons	141	230	Mainland China 154; North Korea 75.
Ferroalloys.......do	12	12	All from France.
Rolled products, excluding pipes.......do	1,061	926	Japan 283; Czechoslovakia 14; Austria 109; Rumania 108; Poland 86; North Korea 65; United Kingdom 42.
Steel pipe.......do	962	657	Rumania 204; Czechoslovakia 133; West Germany 85; Italy 52; Poland 33.
Lead:			
Ore	24,900	23,700	All from Iran.
Concentrate	--------	3,800	All from mainland China.
Ingots and equivalent primary forms.	26,100	38,800	North Viet-Nam 21,300; Yugoslavia 12,100; Bulgaria 3,500.
Tin, primary forms.......long tons	9,700	7,700	Mainland China 4,200; United Kingdom 1,900, Indonesia 700.
Tungsten, concentrate	13,000	12,000	All from mainland China.
Zinc:			
Ore	3,000	8,500	All from Iran.
Concentrate	42,200	36,200	All from North Korea.
Dust	1,500	1,000	All from Poland.
Ingots and equivalent primary forms.	51,600	50,000	Poland 25,600; North Viet-Nam 22,400.
Rolled products	4,200	4,000	All from Poland.
Nonmetals:			
Barite	[r]102,300	106,200	North Korea 57,900; Bulgaria 20,800; Yugoslavia 27,500.
Cement.......thousand tons	1,575	1,353	Rumania 598; mainland China 373; North Viet-Nam 193; Poland 163; Bulgaria 23.
Fluorspar	80,200	90,900	Mongolia 47,100; mainland China 39,900.
Mica	330	200	All from India.
Refractories, magnesite powder	70,300	97,600	North Korea 87,500; mainland China 10,100.
Sulfur	32,100	83,100	Canada 20,700; mainland China 20,200; undisclosed 42,200.
Talc	74,800	59,900	Mainland China 40,300; North Korea 12,000.
Mineral fuels:			
Coal, bituminous.......thousand tons	4,887	5,100	Poland 4,829; mainland China 205.
Coke.......do	607	654	All from Poland.
Petroleum:			
Crude.......do	496	543	All from Austria.
Refinery products:			
Gasoline.......do	1,581	1,535	Rumania 1,263; East Germany 185; Egypt 70.
Kerosine.......do	244	204	All from Rumania.
Gas/diesel oil.......do	227	241	Do.
Residual fuel oil.......do	44	51	Do.
Lubricants.......do	117	147	Rumania 132; Hungary 13; East Germany 1; United Kingdom 1.
Bitumen.......do	63	68	All from Rumania.
Paraffin.......do	34	27	East Germany 15.
Unidentified.......do	6	67	
Total.......do	2,316	2,340	Rumania 1,959; East Germany 201.
Carbon black	[r]29,100	26,700	

[r] Revised.
NA Not available.

COMMODITY REVIEW

METALS

As in past years, output of the ferrous metals industry in 1964 was reported in considerable detail, but secrecy with regard to quantitative statistics on nonferrous metal output continued. General reports on nonferrous metal operations, however, indicated both fulfillment of production quotas and output value about 9 percent higher than planned targets.

Three main trends were noted for the Soviet nonferrous industry: Acceleration of geological exploration and plants construction, development of more byproduct facilities, and improvement of metal recoveries and extraction technology. New discoveries of sizeable nonferrous deposits were announced but determination of workable reserves lagged seriously behind targets. Mine development and plant construction also were unable to meet planned schedules.

Emphasis was given to facilities making use of byproducts and wastes from metallurgical plants, such as those manufacturing chemical fertilizers. Superphosphate was produced at the Krasnouralsk copper plant and sulfuric acid was produced at the Alaverdy copper plant in Trans-Caucasia and Chimkent lead plant in Kazakhstan, north of Tashkent.

Among the useful practices introduced in 1964 were heavy media beneficiation in Far East plants, selective flotation separation of copper and lead minerals without use of cyanides, and application of better flotation reagents in plants at Alma Alta, south Kazakhstan, east Kazakhstan, and Krasnoyarsk. Major Soviet claims in innovations in the field of metal production during 1964 included extraction of metal dust from fumes in smelters of north Caucasus, south Urals, south Kazakhstan, and east Kazakhstan; the use of oxygen in producing copper, lead and zinc in east Kazakhstan plants, and the roasting of zinc and antimony concentrates in fluosolid reactors in plants in the eastern Kazakhstan, north Caucasus, and central Soviet Asia.

Automation was introduced in many plants, mostly in the area of production control. Internal rationalizations and in-plant improvements were very significant in view of the existing power shortage. For example, the technical staff of the Novokuznesck aluminum plant in Siberia adopted larger 250-millimeter anodes that reportedly lowered electric power consumption by 2 percent and anode consumption by 1.5 kilograms per ton of produced aluminum. Installation of a hydraulic catcher at the Belousovka polymetallic ore concentrator in east Kazakhstan increased gold production by 2 percent in that plant.

Construction of a metallurgical plant based on polymetallic ores from the Nikolayevsky deposit was underway. Such ores containing high values of zinc, bismuth, and other metals have been under investigation for more than 10 years. The combine operated an open-pit mine, a concentration plant, and a smelter.

During 1964, many rare metals were produced in industrial quantities. The chemical and metallurgical plant at Irtish and Verkhnodeprovsky combine were the major producers.

Aluminum.—During 1964 the aluminum industry was one of the most successful branches of the Soviet nonferrous metals industry. Discovery of large bauxite deposits in the area of Kursk magnetic anomaly, in the Krasnoyarsk area, and in south Timan made increased aluminum production more realistic. Completion of new facilities strengthened the aluminum production base.

The alumina unit of the Pavlovdar aluminum plant in eastern Kazakhstan went into operation in October 1964; construction started in 1955 and was originally scheduled for completion in 1963. Full scale production of 500,000 tons of alumina and 250,000 tons of aluminum per year reportedly will be delayed more than 2 years.

In 1964, alumina was shipped to reduction plants at Novkuznetsk and Krasnoyarsk. Bauxite was supplied by the nearby Argalyk mine. Electric power was generated by the local thermal plant fueled with coal from the Ekibastuz basin.

The Krasnoyarsk aluminum plant in the Krasnoyarsk area of central Siberia went into production in mid-1964. Construction started in 1959, with production planned for yearend 1962. The plant is rated at about 400,000 tons of aluminum per year. Alumina came from the nearby Achinsk plant and Pavlovdar facilities. Electrical power was supplied by the Krasnoyarsk hydropower plant on the Yenisey River.

Completion of the Kirovabad plant in Azerbaijan was announced in November 1964. Construction of the plant required 8 years. The plant will operate on alunite ores, with an annual capacity of about 200,000 tons of alumina.

Construction of the Bratsk plant near the Bratsk hydropower complex in Siberia was progressing slowly. Reports indicate that this facility will become the largest Soviet aluminum plant with an annual capacity doubling that of Krasnoyarsk (400,000 tons per year).

Improvements made at existing plants also contributed to increased production. Modernization of electrolytic processes at the aluminum works of Novokuznetsk, Volograd, and Irkutsk reduced power consumption. Some automation was introduced in alumina plants, mostly for unloading raw material cars.

Copper.—Soviet copper demand was met by higher domestic output and imports of semimanufactures and cables. Self-sufficiency was far from achieved, although ore and metal production increased notably in 1964.

Discoveries of a copper-nickel ore deposit at Taimir near Norilsk and of copper ore in the Urals (Molodezhnoye Aleksandrinskoye and Dzhuzinskoye) and in Kazakhstan (Sayaskoye, and Orlovskoye) increased copper reserves. During 1964 detailed exploration of the Udokan copper deposit in the Chitinska region confirmed it to be the largest known deposit in the Soviet Union. Several additional copper installations were commissioned in 1964. Copper smelting and electrolytic units were added to the lead-zinc plant at Topkan. The Balkhask electrolytic copper plant at Lake Balkhash in Kazakhstan was enlarged by another section. The copper plant at Alaverdy in Armenia started to produce sulphuric acid from gases. At Gay Orenburg Oblast, construction of a copper concentrator, to be completed by 1966, was in progress; copper concentrate will be shipped to refineries in Southern Urals.

Iron and Steel.—*Iron ore.*—To match steel targets, the Soviets continued to expand iron ore production. Most ore mined was low grade

(35 percent iron) requiring beneficiation. Discoveries of large deposits were reported, many new mines were commissioned and modernized, and several iron ore beneficiation plants were placed in operation. New reserves reported in 1964 totaled 3 billion tons that averaged 40 percent iron. Prominent iron ore deposits included:

1. Deposits in the Zaporozhye area of the Ukraine, where reserves already totaled more than 350 million tons of ore and an iron and steel industry was already established.
2. Newly discovered deposits near Korshunovka in Irkutsk Oblast, Siberia, explored in detail in 1964; where reported reserves totaled about 500 million tons that contained 30 percent iron. These deposits apparently are an extension of the large iron ore deposits near Zheleznogorsk in Siberia and will provide raw material for the rapidly developing iron and steel industry of Siberia.
3. Deposits in Armenia reportedly totaling about 1.5 billion tons, the most significant of which is near the existing Dashkesan mine. The reserves of the deposit alone are estimated at 100 million tons that contain 45 percent iron.
4. New deposit in Kastanya Oblast in northern Kazakhstan reported to have reserves of about 100 million tons.

Most new iron mines and plants were built in the Ukraine, the U.S.S.R.'s main steel center and the principal iron ore supplier to other communist countries; however, new facilities were also developed in the Magnitogorsk area in the southern Urals, in Karaganda, Kazakhstan, and near Novokuznetsk in Central Siberia.

The Zoraya mine in the Krivoy Rog area of the Ukraine, with an annual capacity of 2.6 million tons, was commissioned. Modernization of existing mines and mining equipment was also underway. Reportedly, the Lenin mine in the Ukraine was almost completely automated. Cable tool rigs for drilling blast holes were replaced with rotary units in open-pit mines of the following combines: Sokolovo-Sarbaysky in Kazakhstan, Yuzhny, Severny and Novi Severny at Krivoy Rog in the Ukraine, and Kachkanarsky in the Urals. Better use of excavators was achieved in the mines of the Kursk anomaly and the Mihailovsky combine. The second stage of the north concentrating plant at Krivoy Rog, the first metallurgical base of the Ukraine, was commissioned during 1964 to attain a total annual capacity of 6.5 million tons of ore from the combine.

Development of the Ukraine's second base for metallurgy was progressing in the Kremenchug area. The first million tons of iron ore was produced by the open-pit mines. The concentrating plant was under construction at yearend, and the total annual capacity of the combine will be 15 million tons of processed iron ore. The concentrate will be shipped down the Dneper River to the Zaporozhye plant.

Construction of the 12-million-ton-a-year Korshunovo iron ore concentrator in Irkutsk Oblast in eastern Siberia continued. Starting date for operations, originally scheduled for December 1964, was delayed. The new iron ore beneficiation plant at Novokusnetsk came on stream in the fall of 1964. It was scheduled to supply the West Siberian steel plants with much of their iron ore requirements.

The Sokolovo-Sarbayskiy concentrating plant, under construction for 10 years, was near completion, with production scheduled to start early in 1965. The concentrator will have an annual output capacity of 14 million tons.

Many efforts were made to improve the grade of iron concentrate. Average iron content of concentrates was raised to 56 percent in 1964—1 percent higher than that attained in 1963.

New facilities for agglomeration of iron ore were commissioned toward the end of 1964 in the Ukraine, at Magnitogorsk in the southern Urals, at the Cherepovec plant in northern Russia, and at the Karaganda plant in Kazakhstan. Around 90 million tons of ore were agglomerated in 1964.

Completion of pelletizing facilities was behind target. Most plants scheduled to operate in 1964 were not finished. The pelletizing plant of the Sokolovo-Sarbaiskiy combine will have an annual capacity of 9 million tons of pelletized ore. The new pelletizing unit of the central concentrating plant at Krivoy Rog will be rated at 1.7 million tons per year. Both plants are now scheduled to start production in 1965.

Pig Iron and Steel.—Although new installations were commissioned in 1964, most increases in Soviet iron and steel production can be attributed to better utilization of existing facilities as well as modernization and partial automation of certain plants. More than 70 percent of the 85 million metric tons of steel produced in 1964 was open-hearth steel. Soviet blast furnaces were fueled predominantly (two-thirds plus) by natural gas. Steel production in the Soviet Union was scheduled to be increased to about 90 million tons in 1965.

Since the beginning of the 7-year plan for 1959–65, the Soviets commissioned 17 blast furnaces, 41 open-hearth furnaces, 6 oxygen steel converters, 17 electric furnaces, 39 rolling mills, and 23 coke ovens.

The Ukraine, with Krivoy Rog and Zaporozhye as the main centers, was the foremost pig iron and steel producing region of the Soviet Union. A new blast furnace was commissioned in the Dzerzhinsky plant at Dnepropetrovsk in September 1964. A computer system controls heat, furnace loading, blast temperature and pressure. Television cameras help supervise operation of this first automated blast furnace in the U.S.S.R. A similar automation system for open-hearth steel production was being tested.

A new rolling mill was commissioned in Krivoy Rog basin in the fall of 1964. The mill, claimed to be the largest in Europe was reportedly fully automated. Construction of a large drawn pipe mill to produce pipe 5 to 114 millimeters in diameter started at the Lenin metallurgical plant at Dnepropetrovsk. At the Komunar metallurgical plant at Lugansk, construction of another large rolling mill began early in 1964. The pipe rolling mill at the Karl Liebknecht plant in Dnepropetrovsk was the first Soviet plant to be adapted for welding pipes with high-frequency currents.

At Magnitogorsk, a new blast furnace and a new open-hearth furnace were commissioned in the fall of 1964.

Plans were made to produce 5 million tons of steel annually in the Republic of Kazakhstan in central Soviet Asia, whereas 1964 production totaled only about 350,000 tons. Karaganda, sometimes called the

Magnitka of Kazakhstan, will be the new center. During 1964, two of six planned open-hearth furnaces were completed, and the first steel was produced and sent to the Orsk-Khalilovskiy combine in Orsk in the fall. The Karaganda plant was designed to produce about 3 million tons of pig iron and 4 million tons of steel annually. A rolling mill to be coordinated with the Karaganda operation was under construction in the nearby iron and steel plant at Termir-Tau.

The steel industry of Siberia and the Soviet Far East also underwent a considerable expansion. Construction of the large West Siberian Metallurgical Works near the existing Novokuznetsk Works was in full swing in 1964. This development was part of the so-called "third metallurgical base of the U.S.S.R.," a project aimed at supplying iron and steel requirements of Siberia and the Soviet Far East and leaving the Ukraine and Magnitogorsk, the "first and second metallurgical bases of the U.S.S.R.," free to provide iron and steel to the industry of Soviet Europe and the European Communist countries. The first pig iron was produced in the plant on July 26. Construction of a large rolling mill started, with equipment coming from the East German heavy machinery plant, "Ernest Thaelmann," in Magdeburg.

The Amur plant in the Far Eastern part of the U.S.S.R. was enlarged and modernized during 1964. A new rolling mill was commissioned, aimed at doubling production. Facilities for continuous casting of steel and a new open-hearth furnace were under construction. The plant metallurgist started to use a technique employing radioisotopes for measuring the thickness of the tin on tinplate.

The Cherepovets plant, which had started production in 1956, was developed into an integrated and highly automated iron and steel works. During 1964 a new open-hearth furnace and a large rolling mill have been put into production. Plans were made to install a new blast furnace, an oxygen converter, and a continuous casting shop.

A new open-hearth furnace was commissioned at the Orsk-Khalilovo metallurgical plant in Orenburg Oblast and the first steel was produced in the fall of 1964.

TABLE 4.—U.S.S.R.: Salient statistics of the iron and steel industry

(Thousand metric tons)

Commodity	1960	1961	1962	1963
Pig iron production by process:				
Coke pig iron	46,738	50,879	55,255	58,681
Charcoal pig iron	19	14	10	10
Total	46,757	50,893	55,265	58,691
Raw material consumption for pig iron production:				
Iron ore	23,664	----------	21,922	18,521
Manganese ore	1,948	1,854	2,184	2,223
Sintered ore	63,826	----------	81,198	90,219
Scrap	----------	----------	----------	----------
Coke	33,854	----------	37,001	37,774
Steel production by process;				
Thomas	----------	----------	----------	----------
Bessemer	1,868	1,895	1,909	1,971
Open-hearth	55,109	60,049	64,924	68,069
Electric	5,820	6,301	6,818	7,464
Oxygen blown	2,496	2,506	2,655	2,722
Total	65,293	70,751	76,306	80,226
Pig iron consumption in open-hearth steelmaking	31,302	34,514	37,562	39,480
Scrap consumption in open-hearth steelmaking	26,838	29,340	31,164	32,128

Ferroalloys.—Part of the Soviet effort to improve steel quality was devoted to ferroalloy plants. A new electric furnace was added to the country's largest ferroalloy plant at Chelyabinsk, Central Ural, in the fall of 1964. At the Zaporozhiye ferroalloy plant in the Ukraine, the first furnace of the new smelting shop for ferroalloys was commissioned, reportedly almost doubling the previous plant capacity.

A new blast furnace for producing high vanadium pig iron and the second stage of the ferrovanadium shop was added to the Chusovoy plant in the Perm region. Fuel oil is used for the thermal power installations as well as for the new furnace.

The Zestafony ferroalloy plant in the Georgian S.S.R. was established on the basis of extensive manganese reserves of Chiatura. Three electric furnaces were commissioned in 1964, but reports show that actual operations were postponed until early in 1965. According to the 7-year plan, the plant will have eight furnaces when completed.

Lead and Zinc.—Exploration of large metalogenetic provinces of the Soviet part of Asia resulted in the discovery of significant lead-zinc deposits. Gorevskoye in the Krasnoyarsk region and Karbolikhinskoye and Novo-Zolutushinskoye in Altay, Tishinskoye in Kazakhstan, and Filizchaiskoye in Azerbaydzhan were the new deposits discovered during 1964.

Modernization of mine equipment was underway. Five new types of self-propelled units for drilling blasting holes were placed in operation in the Mirgalimsay mine of the Achisay polymetallic combine.

A production line for sulfuric acid was added to the Chimkent lead plant in Kazakhstan. Use of Bukhara natural gas for smelting lead was introduced, and significant savings in fuel were attained. In the Leninogorsk zinc plant, tests on sulfuric acid production equipment were completed in September and production was expected to start early in 1965. No information on the capacities of these two facilities was available.

Magnesium.—A second line of electrolysis cells were being installed in the Solikomsk magnesium plant.

Manganese.—New deposits of high-grade ore have been discovered near Chiatura in Georgia. At the present rate of production reserves reportedly will last for 80 to 100 years of mining. The newest mine will be the fourth commissioned in this area since the beginning of production in 1959.

The Soviet Union's first flotation plant for manganese recovery will operate on tailings in the Chiatura basin. Hundreds of thousands of tons of high-grade manganese concentrate will be produced each year. Plans were made for automation of the central beneficiation plant of the basin; partial automation of the Ordzhonikidze beneficiation plant has released 60 percent of its workers.

In the Nilopol basin, a new open-cast mine with a capacity of 600,000 tons of crude ore per year was commissioned in the fall of 1964. Construction of a beneficiation plant to upgrade the ore from 40 to 55 percent was underway in 1964, with completion scheduled for early in 1965.

A deposit of manganese oxide was discovered near Kamensk-Uralsky. The deposit, only 10 meters below the surface, is amendable to opencast mining.

Nickel.—A nickel deposit, large by Soviet standards, was found in the general area of Norilsk, center of the Soviet nickel production. A nickel combine was under construction at Adamovka Steppa near Orenburg. A new facility for electrolysis of black nickel began to operate at the "Severonikel" nickel combine in Monchegorsk, Murmansk Oblast.

Precious Metals.—Although the Soviet Union has long been known as a major producer of precious metals, little information was available for 1964.

The U.S.S.R. was second after South Africa and ahead of Canada as a world producer of gold. The gold was derived mainly from placers.

Exact level of production was uncertain. Reports in 1964 indicate discovery of several vein-type gold deposits in eastern Kazakhstan, central Asia, and Transcaucasia. New sedimentary deposits reportedly were found at Chukota and other parts of the northeastern Soviet Far East. Byproduct gold from polymetallic ores was of far less significance than placer gold, but recovery was improved. Introduction of "hydraulic catchers" at Belousovka raised gold production of this concentrating plant 2 percent.

Most Soviet silver was produced as a coproduct of copper, lead, and zinc. No significant events were reported for silver production during 1964.

No information was available on platinum-group metal production or exports. World trade data from other countries indicated that the U.S.S.R. was the leading world supplier of palladium and that the U.S.S.R. was the largest world platinum-group metal producer. Production was believed to be obtained from copper and nickel ores.

Selenium and Tellurium.—A plant at Chelhovo reportedly was successfully recovering selenium and tellurium from the residues of sulfuric acid and the cellulose industry. A modern selenium facility was commissioned in the Mari Electrical Equipment Plant in Yoskhar-Ola, north of Kazan.

Tin.—Production of tin in the U.S.S.R. continued to be inadequate, and imports were required during 1964. In the past, the main supplier was Communist China, but since the political split, there has been a sharp drop in tin import. To assure sufficient supplies of tin, the Soviet Union took measures to increase domestic production as well as imports from the West.

During 1964 new tin deposits were reportedly discovered in the Khabarovsk region, Soviet Far East (Festivalnoye). A new tin combine was commissioned at Shirlovaya Gora, Chita Oblast, Siberia. Facilities for concentration and smelting of tin were enlarged in many places during 1964.

In the Soviet Far East, capacity for processing tin concentrate was increased through the use of double-deck shaker tables. Construction of the second stage of the ore dressing combine at Solneehuyy Khabarovsk Kray was begun. The combine is producing the cheapest tin concentrate in U.S.S.R. The Krustalinskiy mining and concentrating combine in Vladivostok region commissioned a new flotation plant to process ores and tailings that cannot be concentrated by gravity methods.

NONMETALS

Soviet efforts to expand industrial and agricultural production have placed emphasis on the production of cement and other construction materials, refractories, and mineral fertilizers. However, many other nonmetals were explored and developed, with the aim of achieving self-sufficiency and providing surpluses for export.

Asbestos.—The Soviet asbestos industry had a successful year in 1964 both in uncovering deposits and in completing new plants. Canadian technical assistance and sale of asbestos mill equipment played a role in raising output. Asbestos development was centered in an area south of Baikal, Tuva region, Kazakhstan, and in the Urals near Azbest.

Exploration continued on an asbestos deposit in the Muya River basin of Bauntovskiy Aymak. Results appeared to be promising and the first shipments of asbestos fiber were delivered to the industries of the Urals during 1964. Development of an asbestos mine and construction of a concentrator were scheduled to start in the remote area of Bauntovskaya Taiga in the near future.

The Ak-Davurak or Tuva asbestos combine in the Tuvian region with a capacity of about 9,000 tons of asbestos per year was completed in 1964.

In Kazakhstan, the first stage of the Dzhetygar asbestos combine in Tselinnyy Kray was completed and the beneficiation plant started experimental production in the fall of 1964. Ore was being hauled by electric locomotives made in East Germany. Initially, a reserve of 3.5 million tons was readied for production.

In addition to the commissioning of the Dzhetygar combine, discoveries of asbestos deposits in Karaganda and Dzambul Oblast were announced.

In the Urals, the mainstay of the Soviet asbestos industry, development of milling facilities near Azbest continued. The first 2 of 15 shops under construction at the concentrator were commissioned. Upon completion of project, output will increase by 50 percent compared with present production.

Bentonite.—Because of expanding drilling and oil refining activities, the Soviets stepped up exploration for bentonite and development of bentonite plants during 1964. Armenia and Kazakhstan were the two principal centers of bentonite activities in the U.S.S.R.

The Idehevanskoye deposit alone has reserves of over 30 million tons. A mill with an annual capacity of 250,000 tons of powdered bentonite was planned, and construction of a 20,000-ton-per-year plant for producing activated clay was underway.

In East Kazakhstan, large deposits of bentonite with reserves totaling 50 million tons were discovered in Manrak. In South Kazakhstan at the Darbaza station, production started from a bentonite deposit with reserves of around 5 million tons; daily output reached 1,000 tons. Reports also indicated discoveries of bentonite and the commissioning of a mill with an annual capacity of 50,000 tons of powdered bentonite near the Kaskazgan mines in Tashkent. At the Idzhevan deposits in Armenia a new bentonite mill with an 80,000-ton annual capacity was under construction.

Cement.—The Soviet cement industry produced 64.9 million metric tons of cement in 1964, about 6 percent more than in 1963. Substantial reserves of raw material are available to support higher production. However, the geographical distribution of resources, facilities, and markets is unfavorable and large quantities of cement have to be moved considerable distances across the country.

During 1964 the major effort was concentrated on completion of plants and improvement of technology.

The Azerbaidzhan plant was expanded by a new unit with a 450,000-ton annual capacity. This was the fifth unit of this plant, and brought total capacity to more than 2 million tons per year. Because of its location at Baku, the plant specialized in production of cement for the oil industry. Discovery of a cement blend for deep wells was announced. The cement is sulfur resistant and can withstand temperatures up to 300° C. and pressures up to 700 atmospheres, corresponding to API cements, E or D. Industrial production was scheduled to start immediately.

Assembly of a second unit at the Novo-Armene cement plant in Lithuania has been completed. Cement produced in this unit was for use in production of asbestos cement pipes.

Reports indicate construction of a new cement plant at Pokrousk in the Yakutsk A.S.S.R. No capacities were reported, but a standard production line with a 450,000-ton annual capacity may be built.

Two 170-meter-long rotary kilns were installed in the Sebryakovo plant in Volgograd Oblast. These new installations increased the annual plant capacity by 720,000 tons.

Partial automation was introduced in two plants during 1964; at the Novorossiysk October cement plant, rotary kiln operations were automated, and work was begun on centralization of control of all rotary kilns in the Chimkent "Lenin" cement plant. Because of difficulties in providing adequate electronic equipment, completion was delayed until the beginning of 1965.

Diamonds.—In Yakutia, the largest producer of natural diamonds in the U.S.S.R., new deposits were discovered at Anabar and Udachnaya. According to reports, diamonds from these areas are larger than those previously produced in Yakutia. Discovery of new diamond deposits in Vishera Basin, Urals, also were announced. Some of these deposits reportedly are larger than any now in production in the area.

Little information was available on the production of synthetic diamonds. In the Kiev economic region alone, 96,000 carats was used for the production of tools and instruments in 1964, or 20 times the quantity produced in 1963. The main producer continued to be the Kiev plant. However, plans were made to erect new plants in Armenia and Georgia, thereby shifting production eastward.

Fertilizers.—Need for expanding production of mineral fertilizers was frequently mentioned in the Soviet press. Accordingly, large investments were made to explore and produce raw materials and to produce finished mineral fertilizers.

Construction of a nitrate fertilizer plant at Kohtla-Jarve in Estonia continued during 1964. Initial production, scheduled for mid-1965, was set at 30,000 tons of fertilizers.

In the field of apatite production the new Tsentralnyy apatite mine and concentrator were commissioned in 1964 on the Kola Peninsula, the center of Soviet apatite production. The facility was to produce 2 million tons of concentrate per year. Two other apatite mines in the area also were being developed. A new deposit of apatite was discovered in the Buryat A.S.S.R. On the Selenga River near the railroad line, production was scheduled to start in the near future.

Production was started at the Zhany-Tas phosphate rock deposit at Karatau, Dzhambul Oblast. Planned output was 800,000 tons of ore per year.

Potash deposits have been discovered on the southwest spurs of the Turkestanskiy mountain range. Seams more than 5 meters thick occur at a depth of 80 to 120 meters. Reports indicate that reserves could sustain a fertilizer plant capable of supplying the whole of Soviet Central Asia in potash needs. Several new deposits of potash were discovered in Perm Oblast, north of the Berezniki mines. Reserves were reported at about 2 billion tons of K_2O. Production of potassic fertilizers is expected to increase by completing several potassic combines in the Berezniki area as well as the second section of the first combine in Soligorsk, Belorussia. Both these areas are well-known for Soviet production of potash.

The Soviet press announced that the first natural deposit of metaborite in Kazakhstan was discovered in the fall of 1964.

Fluorspar.—A new fluorspar beneficiation plant was commissioned in Yaroslavka in an area south of Khabarovsk in the Soviet Far East. Plant capacity was not reported, but it was indicated that after completion of second and third stages the combine will be the main supplier of fluorite concentrate in the U.S.S.R.

Gypsum.—An announcement was made that a gypsum deposit was discovered in the vicinity of Semipalatinsk near the Irtish River. First indications are that the deposit is only of local significance. A 110,000-ton-per-year modern and partially automated gypsum plant was commissioned in Beltsy.

Lime.—A new limestone quarry with an annual output capacity of 2 million tons was commissioned near Achinsk in the fall of 1964; the limestone will be used by the Achinsk cement and alumina plants. Another limestone quarry with an annual capacity of 750,000 tons was commissioned in Tsiteltskaro, Azarbaidzhan and the output will be shipped to the Rustavi Metallurgical Plant.

Production of limestone started on southern slopes of the Sikhote Alin mountain ridge near Spask to supply a new cement plant under construction nearby.

Perlite.—Activities were concentrated in Armenia, which has rich deposits. The research institute in that republic developed profitable methods for processing perlite, and the first perlite installation was commissioned in Yerevan as part of the the alumina plant. A plant capable of producing about 30,000 cubic meters of expanded perlite per year was under construction. This plant is on the southern slopes of Aragats Mountain. A new shop for processing raw perlite was built at the Rustan mineral wool plant.

Refractories.—Production paced with rising industrial output, but quality improvements were not as good as expected. Many blast furnaces and other foundry equipment were not operative because of frequent repairs resulting from low-quality refractories. During 1964, major efforts of the refractory industry were on automation, better use of existing facilities, and opening of new plants.

A new deposit of quartzite with reserves estimated at 150 million tons was discovered at Makbel in Dzambul Oblast.

At Avchala in Georgia, a new silicate brick plant went into operations in the fall of 1964; plant capacity was about 65 million silicate bricks and 35 million blocks per year.

Plans call for construction of a large refractory material combine at Razdan in Armenia to process local raw materials. The facility is to supply refractories to plants in Armenia, the Caucasus, and the Volga region.

MINERAL FUELS

Rising output of power and fuels remained the foundations upon which the whole structure of Soviet economic plans have been built. Recent discoveries of large oil and gas deposits and completion of the basic pipeline network for distribution of these fuels were reflected in the shift of the energy balance away from coal and hydroelectric power and towards oil and gas. In 1964 coal contributed only 46 percent to Soviet energy production, a significant drop compared with the 64 percent contribution in 1954.

Coal.—Extensive resources and high output levels made coal one of the most significant mineral commodities produced in the U.S.S.R. during 1964. Coal, the leading source of energy, provided employment for the largest number of workers. Several new coal basins were discovered in 1964, existing mines were expanded, and new mines developed. About 16 million tons of new capacity was added in 1964, which contributed to the 554 million metric tons reportedly produced in the Soviet Union during the year. The Ukraine and central Asia were the main centers of coal activity. However, important developments in coal took place in the Far East and in the Caucasus.

The Ukraine and southern Bellorussia were the foremost coal producers in the U.S.S.R. More than one-third of the total Soviet coking coal came from the Ukraine where about 1 million workers are employed in coal mines. In the new mining area of western Donbas, the Chernovskaya and Terinovska (or Ternovka) mines were commissioned in Dnepropetrovsk Oblast, each having an annual capacity of 900,000 tons of coal. The development of another mine, Zakhidno Donbaska No. 29, was started near Vershe, a village; planned capacity of this mine was about 1.2 million tons annually.

In the area of Lungansk a new mine with an initial capacity of about 300,000 tons per year was commissioned in 1964. Plans call for production to ultimately reach 750,000 tons of coal annually. A significant extension of an operating mine was the commissioning of the second phase of the Vysivka-Hluboka mine near Makeyevka, raising capacity to 900,000 tons of coal annually. The mine, the deepest in the U.S.S.R., produced coal from 1,200 meters. The future of the Donbas Basin is connected with deep mining since all coal to 400 meters depth will be exhausted by 1980.

Another success was the dicovery of a rich anthracite deposit, low in sulfur and in ash, near Zverevo in Rostov Oblast. Reserves, though not reported, must be substantial because development of three mines with an annual capacity of 3 million tons each was already underway. Plans were made for several other mines in this new anthracite area.

The second center of Soviet coal activities was the vast area of Central Asia including Kazakhstan and Siberia. Major effort was focused on the Karaganda and Kamsk-Achinsk basins. However, significant developments also took place in Ekibastuz close to Pavlovdar and near Tiblis in Georgia. Coal mining in Central Asia had an important role in the competition between gas and coal in the total Soviet energy picture. In addition to its local importance coal supplied energy for the developing industry of Siberia. Favorable geological conditions, near surface and thick coal seams, and huge reserves make mass production of inexpensive coal possible. These conditions and the shortage of pipe have thus far slowed the conquest of coal markets by gas. In the Tentek area of the Karaganda basin, the Tentekskaya Mine No. 3, with a planned capacity of 1.2 million tons of coking coal per year, was commissioned during the fall of 1964. Since this mine is fully mechanized, an increase of 50 percent above the prevailing standard productivity of the basin is possible. Six other Tentek area mines were also under development, each with a planned annual capacity of 1.2 million to 1.3 million tons of coking coal. Total reserves of all Tentek deposits were reported to be about 5.5 billion tons of coking coal.

Several opencast mines were developed in the Kamsk-Achinsk brown coal basin, near Krasnoyarsk, Siberia. The coal was used by the power station at Nazarevo. Development of new mines in the basin was to start in the near future. Combined capacity was planned to be about 40 to 45 million tons of brown coal per year, against a reported reserve of 160,000 million tons.

Development of a new opencast bituminous coal mine started at the Ekibastuz coal basin near Pavlovdar. The mine is to have an annual capacity of 45 million tons. East Germany will supply excavators with a capacity of 3,000 cubic yards per hour. The coal will fuel a thermal power station, which in turn will provide electricity for the alumina plant and other consumers in the Pavlovdar area. Reconstruction of three opencast mines in Ekibastuz started late in 1964. The main work was in haulage, with the adoption of 180-ton, alternating-current electric locomotives.

Lesser developments occurred in the Soviet Far East. During 1964 discoveries of new deposits in the area of Svobodny city, Shimanovskaya station, and in the Vitim valley were reported. Total new reserves exceed 1 billion tons of mostly brown coal. The Pavlovka opencast mine near Ozernaya railroad station and the Edinka opencast mine in the Maritime Kray, both 3-million ton-per-year operations, were opened during 1964. The Retikhovka strip mine started production with a capacity of 600,000 tons of coal per year. The second stage, planned for late 1964, was delayed because of administrative complications. Development of the Kirglizia opencast coal mine at Kyzylkiya was behind schedule. When completed in 1967, this mine is scheduled to produce 4 million tons of coal annually.

Petroleum.—Although crude oil output increased 9 percent over production in 1963 and totaled 224 million tons, the Soviet petroleum industry did not have a particularly eventful year in 1964; new discoveries were nominal. Ambitious plans for 1964 oil and gas production increases were achieved only through use of a large number of rigs and tremendous waste in manpower and materials.

Drilling costs per unit distance drilled continued to rise as depth of wells increased. During the last decade, the average depth of producing wells has risen from 1,305 to 1,623 meters and that of exploration wells has risen from 1,531 to 2,150 meters, while drilling speed per drill month dropped from 1,084 to 991 meters for production drilling and from 417 to 368 meters for exploration drilling.

Only 90 percent of the 1964 exploration target was met. Repairs and other downtime resulted in a 49-percent loss of rigtime on exploratory drilling and a 30-percent loss on production drilling. Soviet drilling equipment remained lower in quality than most western equipment, necessitating frequent repairs. Proficiency of maintenance was also below par, and lack of spare parts accentuated the difficulties. Many fishing jobs were necessary because of poor equipment and drilling bits. For conventional rotary drills, Soviet-made three-cone drilling bits have an average life of only 20 hours of effective drilling in soft and medium hard formations. For the turbodrill, the life of these bits drops to 4 or 5 hours. Rubber pump parts also have a short life, requiring frequent changes, sometimes every 8 hours. Blowouts in the Khechigev oilfields of Kharkov Oblast and in the Urta Bulsk field of Bukhara Oblast reflected bad practice in pulling out bits. The Urta Bulsk well has been burning since early 1964.

Turbodrilling prevailed in gas and oil; in production drilling, about 87 percent of the footage was by turbodrilling, and in exploration drilling it was 79 percent. Average depth was 1,650 meters in production and 2,250 meters in exploration. About 74 percent of the total crude production was obtained from flowing wells, 24 percent by pumping wells, and 2 percent by gas-lift and other methods. Hydraulic fracturing and secondary recovery were becoming more significant methods in Soviet crude oil production. About 2,500 fracturing jobs were performed in 1964.

Principal crude oil sources continued to be the Srednye-Volga and the Bakue regions. However, the overall trend of oil development showed movement toward the east. Kazakhstan, Siberia, and the Soviet Far East were the scene of intensive exploration and of major discoveries. Nonetheless, significant discoveries also occurred in Belorussia and Ukraine.

Oilfields.—The discovery of an oilfield northeast of Mozyyr on the Rechitsa structure in Belorussia, a western republic of the U.S.S.R., came after 15 years of exploration. The pay zone depth is about 2,000 meters and its age is Devonian. Tests indicated a daily output of 150 tons per well. The crude is light and low in sulfur. A second oil-bearing formation at 3,000 meters was not yet tested.

Large deposits of oil and gas have been discovered in the Donets-Dneper syncline. The quality of oil and the depth of producing horizons, usually 1,500 to 3,000 meters, vary from field to field.

The total potential of the large oil- and gas-bearing area in Western Kazakhstan, on the shores of the Caspian Sea on the Mangyshlak Peninsula, has yet to be determined although a discovery well was drilled in 1961. As of 1964, 36 structures had been discovered by geophysics, promising producers of gas and oil. During 1964, two new structures—Zhetibaisko and Uzenysko—each showing several producing zones, proved oil and gas bearing. The oil is light and low in sulfur. The age is Mesozoic and pay zone depth is around 2,400 meters. Reserves were reported at several million tons of crude oil. Development of deposits on the southern slope of Mangyshlak and on the southeast side of the Caspian depression will make Kazakhstan a very significant producer of crude oil.

The large territory of Siberia can be divided into the western and eastern petroliferous sections; in 1964 western Siberia became a new Soviet oil-producing region.

Exploration and development were extremely difficult in this area of swamps and cold climate. Lack of roads, housing, and other facilities accentuated the problems. So far, 17 oil and 22 gasfields have been reported in Western Siberia. The depth of producing horizons ranges between 1,500 and 2,500 meters. Crude oil is light and low in sulfur. Oil reserves promise to make this, "the third Baku," the largest oil producer in the U.S.S.R.; gas reserves are even more substantial.

Drilling of production wells has started in Tyumen Oblast, Ust-Balyk, the Megion, and Shaim. Production on a moderate scale began in the Tyumen region, with the oil transported by tankers and barges during the shipping season in Irtish. Approximately 300,000 tons were shipped to the refinery at Omsk in 1964. One million tons is expected to be produced in 1965. Plans call for construction of pipelines, storage tanks, and living facilities in the next 2 years. An oil research institute has been established in Tyumen, which has the main task of studying local conditions, particularly with regard to operations in cold weather.

Eastern Siberia was far less explored than western Siberia. However, a large oil and gas potential has also been determined. Discovery of oil and gas in Cambrian formations opened up good possibilities for new finds. Successful exploratory drilling near Markovo village in the Lena River Valley opens northeastern Siberia to more future discoveries.

Natural Gas Fields.—Good potential and easy utilization make natural gas the most sought after energy source in the U.S.S.R. Thus, the Government emphasized exploration for gas. During 1964, about 40 new gasfields were discovered in the country and Soviet natural gas production rose by 20 percent to 4,105 billion cubic feet.

Although the gas found in the western parts of the Soviet Union are vital to the existing industrial structure, the most significant discoveries are those in western Siberia and in Mangyshlak, West Kazakhstan. Tyumen Oblast in Siberia, possessing 30 percent of the Soviet gas reserves was the leading center of activity. Gas from a 1964 discovery near Tazovsk in Tyumen will be supplied to industry in Norilsk through a pipeline to be built during 1965. Reserves of gas estimated at 1,866,000 million cubic feet were found north of Tomsk in the middle reaches of the Vasyugan River. Depth of the producing zone is 2,400 meters in this deposit, situated near the industrial center at Novosibirsk. Gas was also found on the banks of Angara River, close to the large Zhelenogorsk iron deposits. Depth of producing formation is 1,225 meters, and preliminary analysis of the gas showed a high content of hydrocarbon liquids.

The Nedzhelinskoye deposit in the Yakutsk A.S.S.R. reportedly has extensive reserves of gas with a high content of condensate. Tests from 2,000-meter depth indicate a production of 74.64 million cubic feet of gas daily. Local geologists were confident that oil will be found in this deposit in the near future.

New natural gasfields were reported in the Bashkir A.S.S.R. The Fillipovka field extending into Orenburg Oblast appears to be the largest. Depth of producing formations is around 2,300 meters. A new extension of the Feragan Valley gasfield was producing from the depth of 2,500 meters. These new discoveries are significant because they are close to the main Bukhara-Urals gasline. Thus, no large investments are necessary to deliver the gas to the industrial centers of the U.S.S.R.

Newly discovered gas reserves in eastern Turkemenia amount to 9,330 billion cubic feet, or a fifth of the previously reported total. Gas started to flow from a 3,000-meter well in the newly discovered gasfields at Karakum in Turkemenia.

Three natural gas deposits have been discovered in the Karshi Steppes in Uzbekistan. Combined possible reserves total no less than 18,660 billion cubic feet. The gas is under very high pressure, 500 atmospheres at a depth of 3,000 meters. Further north, stratigraphic drilling conducted on the Ust Yurt plateau resulted in an unexpected Eiocene gas discovery at 400 meters depth. The area may also have multilayer Jurassic gas horizons at fairly great depth.

The Adamtash gas deposit in the western foothills of the Zeravashan Range in Uzbekistan produced gas from depths of up to 1,500 meters. The principal producing zone is 300 meters thick, and reserves are reported at 3,732 billion cubic feet.

Gas was found in Devonian formations near the Veliki Mosti Village in Precarpatia, the first of such age discovered in the southwest of the Russian plateau.

The announcement of natural gas discoveries in Dnepropetrovsk Oblast near Pereshchepino and Volgograd Oblast at Shcherbakov and near Stavropol indicate that a large reserve of fuel will be accessible to the Ukrainian industry. At the Carpatian fields, extensions of existing structures have significantly increased reserves of the area. Reports place new reserves at 18,660 billion cubic feet.

Refineries.—Although reasonably complete information on Soviet oil refineries continued to be withheld, six significant additions to existing facilities were reported in 1964. Capacity of the Angarsk oil refinery near Irkutsk, Siberia, was doubled to 13.2 million tons per year. A new catalytic reforming plant was completed in the fall of 1964 at the 6.6-million-ton-per-year Perm refinery in the Kama River Valley. Capacity of the new plant is not known, but gasoline of 96 to 98 octane reportedly was being produced. A large primary refining installation has been commissioned at the modern, automated Yaroslav oil refinery north of Moscow. When completed the plant will have a total annual capacity of 7.5 million tons. The Soviet Union's largest kerosine producing complex was completed at the Fergana oil refinery in Tashkent. Capacity of the kerosine complex has not been reported, but crude throughput capacity of the refinery is 6.6 million tons of crude oil per year. Construction of an oil-processing combine near Severodonetsk started. Capacity of the plant, which will produce gasoline and lubricants, was not reported. The 6.6-million-ton-per-year Novobakinska oil refinery in Baku commissioned a new catalytic cracking plant, which is to start supplying raw materials to the Sumgait oil and chemical combine early in 1965.

Transport.—Transportation of large quantities of crude oil and refined products still remained a tremendous burden to the weak railroad system of the Soviet Union. To avoid further problems, Soviet planners made intensive efforts to build new oil and gas pipelines. The master plan was to build a unified pipeline system connecting producing fields with industrial centers and providing major pipelines to bring crude oil to East European and West European markets.

After 8 years of construction, the main East-West line was completed in 1964, connecting the western border of the Communist world with Irkutsk in Siberia. The European part of the system, called the "CEMA" or "Druzhba" pipeline, starts in the waste plains of the Volga River and ends at East German, Polish, Czechoslovakian and Hungarian refineries. From Kuybishev in the Urals, the pipeline reaches Unecha through Michurinsk. Total length of this section is 1,180 kilometers, and the diameter of the pipes is 40 inches.

At Unecha the pipeline branches: One branch, 28-inches in diameter, extends 375-kilometer to the Polotsk refinery; the other, 40-inches-in-diameter, extends 163-kilometer to Mozhyr. At Mozhyr, the line branches again. The southern 24-inch-in-diameter, 400-kilometer branch extends to Bratislava, Czechoslovakia, and the northern 24-inch-in-diameter branch extends 752-kilometer to Plock, Poland. From Plock, there is a 20-inch-diameter, 389-kilometer line to Swedt, East Germany. The southern branch is linked to Hungary's Szazhalombatta refinery by a 12-inch, 129-kilometer pipeline from Shahy, Czechoslovakia.

Many pipeline projects of local significance were started and/or completed in 1964. A 250-mile pipeline to connect the Siberian oilfields with the refinery at Omsk was under construction in mid-1964. Work was difficult because of swamps, dense wooded areas, and extreme climate.

In the Caucasus region on the shores of the Black Sea, two installations were commissioned to facilitate export of Soviet crude; the 220 kilometer, 28-inch Tikhoretsk-Novorossisk pipeline connects the port at Novorossisk and inland fields. The port can accommodate six 100,000-ton tankers simultaneously.

Most domestic gas pipelines completed were of lesser significance than projects still under construction. Main areas of gas pipeline construction were in western Siberia, central Asia, the Caucasus, and Europe.

A second parallel line was being added to the existing main pipeline carrying gas from Bukhara to Urals industry. This pipeline, will be completed in 1965, doubling transmission capacity.

215-998—66——46

Construction began on the Bukhara-Alma Alta gas pipeline, which is to supply natural gas to Tashkent, Frunze, Alma Alta, and other towns in Uzbekistan and Kazakhstan. Completion date is scheduled for early in 1966. The new pipeline and the existing Bukhara-Tashkent pipeline will provide a system with a yearly capacity of 375 billion cubic feet of natural gas. Another pipeline of 500 kilometers is also under construction in Tashkent to connect Maylisn in the Fargan valley with Adizhan, Uzbekistan.

The Bukhara-Chiment pipeline was completed in 1964. Capacity was rated at 447 million cubic feet daily. Gas from this line was already being used in the lead-zinc plant and other enterprises in Chimkent.

In Siberia, preliminary work was underway on a natural gas pipeline from the Tazovskoye fields in Tyumen Oblast to Norilsk. The pipeline, 640 kilometers long, will have a capacity of about 130 billion cubic feet of gas yearly. Eventually, this line will be extended farther north. The crossing of the Yenisey River, the marshes, and the lakes, as well as the permafrost will make the project one of the most difficult undertakings in Siberia.

New pipelines were added to existing networks in the Caucasus and Baku areas, including a 2- to 3-inch in diameter, 92-kilometer line from Voznesenskaya to Grozny and a line of unspecified diameter from the Siazon gas plant to the Sumgait distribution station.

The first Soviet pipeline for transporting liquified gas has started operations. This line of 288 kilometers connects Minnibayevo with the Kazan organic synthesis works.

Plans were underway to build a new 2,500-kilometer gasline to bring gas from eastern Karakum near the middle reaches of the Amu-Darya River to Moscow, Belorussia, and the Baltic Republics.

The Soviet Union and Czechoslovakia had joined forces to construct a gas pipeline from the western Ukrainian gasfields to Bratislava, roughly parallel to the oil pipeline "Druzhba." This pipeline will be 550 kilometers long and will have an annual capacity of 37 billion cubic feet of gas. Eventually, the annual capacity will be 186 billion cubic feet.

To improve the supply of gas to Moscow, a new set of compressors was added to the Schekino pumping station, 15 kilometers south of Tula. The station, which serves both the Stavropol-Moscow and Krasnodar Kray-Serpukhov gaslines, has a daily throughput of about 1,300 million cubic feet per day and is substantially automated.

Installation of these compressors represents a solution for one pipeline to a major problem in operation of the Soviet Union's overall gas distribution system. Many major pipelines have not reached rated delivery capacity because they have been placed in service without any compressors.

The gas supply of Leningrad will be doubled when the second 800-kilometer Serpukhov-Leningrad line, started in 1964, is completed.

The Mineral Industry of the United Kingdom

By Justin B. Gowen[1]

EXPANSION of the domestic economy of the United Kingdom which started in 1963 continued throughout 1964. The country's gross national product rose to nearly $81 billion, an increase of about 7.1 percent at current prices, or 5.3 percent adjusted for price increases, compared with $75.6 billion (revised) representing increases of 6.3 percent at current prices and 4.6 percent adjusted in 1963.

Important factors in stimulating the economy were the fiscal measures inaugurated in 1963 involving changes in amortization allowances for new capital investment and easement of credit regulations for shipbuilding and industrial development projects. The effects of these measures were especially noticeable in the proportionately greater increases in the production and consumption of metals and materials for capital plant, buildings, dwellings, and related industries.

Although total national employment increased 128,000 (0.51 percent), employment in mining and quarrying decreased 27,000, mainly as a result of a reduced labor force in coal mining caused by closure of some mines and modernization of others.

Notable increases were shown in employment in metal processing and manufacturing industries, engineering and electrical goods, and construction. At the end of June 1964 the total working population in Great Britain numbered 25,199,000, including employment in the mineral based industries as follows in thousands of persons:

	1963	1964
Mining:		
Coal	617	590
Other	67	67
Total	684	657
Manufacturing:		
Chemicals	511	506
Metal manufacture	591	620
Engineering and electrical	2,125	2,182
Shipbuilding	211	203
Vehicles	866	870
Metal goods, n.e.s.	546	566
Nonmetal manufactures	337	350
All other	3,528	3,541
Total	8,715	8,838
Construction	[1] 1,681	[1] 1,755

[1] Not strictly comparable with previous years.

---

[1] West Europe specialist, Division of International Activities.

PRODUCTION

New records were established in the production of pig iron, crude and finished steel, most of the nonferrous base metals, and in nonmetallic construction materials.

TABLE 1.—United Kingdom: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Primary	29,384	32,812	34,576	31,065	32,220
Secondary	111,390	119,050	131,780	148,970	171,614
Cadmium ... kilograms	106,909	^{r}98,557	107,610	^{r}111,826	^{r}197,439
Copper:					
Electrolytic	22,132	21,965	25,290	29,804	30,510
Fire refined	196,772	216,119	206,456	184,228	214,565
Total	218,904	238,084	231,746	214,032	245,075
Primary—all from imported blister (included in total)	112,706	131,080	118,862	91,429	112,502
Brass and bronze ingots	133,535	133,262	131,727	124,849	127,536
Iron and steel:					
Iron ore, 17 percent Fe ... thousand tons	17,362	16,783	15,522	15,151	16,588
Pig iron and blast furnace ferroalloys ... do	16,016	14,984	13,912	14,825	17,551
Other ferroalloys ... do	183	186	175	120	NA
Steel ingots and castings ... do	24,695	22,441	20,820	22,882	26.651
Finished steel deliveries from United Kingdom production new material ... do	17,924	16,623	15,256	16,574	20,614
Lead:					
Ore and concentrate, lead content	1,405	1,502	405	250	180
Refined lead [1]	92,560	87,663	90,026	96,584	122,690
Magnesium	^{r}3,746	^{r}5,283	^{r}5,043	^{r}4,735	^{p}4,775
Nickel, refined and ferronickel	34,340	38,000	38,300	^{r}38,100	38,000
Silver ... troy ounces	^{r}7,098	4,744	514	NA	----------
Tin:					
Ore and concentrate, tin content ... long tons	1,199	1,210	1,181	1,226	1,226
Refined:					
Primary ... do	26,286	24,449	18,749	^{r}17,411	16,849
Secondary ... do	1,386	1,903	^{r}1,143	^{r}1,278	2,466
Zinc, slab	75,496	94,375	98,837	100,617	110,036
Nonmetals:					
Barite and witherite	61,172	83,168	76,888	^{r}57,387	^{p}57,900
Calcite	24,400	27,400	28,400	24,400	25,400
Cement ... thousand tons	^{r}13,501	14,376	^{r}14,253	^{r}14,059	^{p}16,966
Chalk ... do	15,754	^{r}17,779	^{r}17,967	^{r}17,542	^{p}18,445
Chert and flint ... do	160	175	^{r}141	99	^{p}38
China stone ... do	48	50	53	51	^{p}58
Clays:					
China clay ... do	1,664	1,746	1,724	1,928	^{p}2,065
Fire clay ... do	2,194	2,218	1,960	1,712	^{p}1,794
Potters and ball clays ... do	530	544	558	602	^{p}640
Other clays and shale ... do	16,300	10,060	12,350	17,320	^{e}99,400
Diatomite	15,017	22,607	20,332	14,466	^{e}15,000
Fluorspar [2]	99,109	^{r}86,767	^{r}71,879	^{r}88,497	^{p}107,700
Gypsum and anhydrite ... thousand tons	3,653	3,791	4,063	^{r}4,143	^{p}4,584
Igneous rock ... do	16,526	17,672	^{r}18,574	^{r}18,569	^{p}23,093
Limestone ... do	40,722	^{r}42,586	^{r}44,760	^{r}47,878	^{p}55,392
Salt:					
Rock ... do	152	290	485	764	^{p}704
Evaporated ... do	1,253	1,208	1,280	^{r}1,411	^{p}1,369
Other ... do	4,455	4,262	4,312	4,320	^{p}4,672
Sand:					
For glassmaking ... do	1,171	1,153	1,161	1,245	1,029
Other silica sand ... do	731	703	572	^{r}506	619
Moulding and pig bed sand ... do	^{r}838	725	^{r}806	846	846
Other industrial sand and gravel ... do	72,652	81,164	^{r}81,446	^{r}85,191	86,059
Sandstone ... do	5,039	4,981	^{r}5,322	^{r}5,395	6,408
Slate ... do	94	99	94	125	125
Strontium minerals	6,710	8,818	6,637	9,164	^{e}9,200
Sulfur, recovered elemental ... thousand tons	^{r}64	^{r}60	^{r}53	^{r}48	^{p}5[illegible]

See footnotes at end of table.

TABLE 1.—United Kingdom: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Mineral fuels:					
Coal:					
Anthracite……thousand tons	3, 563	3, 604	3, 964	4, 226	4, 672
Bituminous……do	193, 059	189, 918	196, 641	194, 712	192, 063
Recovered slurry and fines……do	1, 120	1, 520	2, 030	1, 520	1, 320
Coke and coke breeze:					
Coke oven coke……do	19, 050	18, 060	15, 790	15, 730	17, 130
Gasworks coke……do	9, 990	9, 980	9, 880	9, 870	8, 940
Coke breeze……do	3, 820	3, 710	3, 650	3, 680	3, 620
Fuel briquets……do	1, 435	1, 492	1, 573	1, 679	1, 351
Oil shale……do	680	484	159	----------	----------
Shale oil……do	61	43	16	----------	----------
Crude petroleum [3]……do	87	110	115	129	134
Carbon black……do	146	137	128	140	154
Petroleum refinery products:					
Liquid petroleum gases……do	398	467	642	942	1, 228
Light distillate feedstock for gasworks……do	436	546	819	1, 037	1, 401
Aviation gasoline……do	252	216	198	145	166
Wide cut gasoline……do	1, 054	1, 118	1, 294	699	847
Motor and industrial spirit……do	6, 743	7, 162	7, 147	6, 927	7, 803
White spirit……do	165	150	142	143	144
Kerosine, including jet fuel……do	2, 321	2, 726	2, 652	3, 132	3, 220
Gas/diesel oil……do	7, 771	8, 756	10, 126	10, 961	12, 185
Fuel oil……do	18, 830	21, 490	22, 311	21, 481	23, 176
Lubricating oils……do	927	973	913	983	1, 053
Bitumen……do	1, 054	1, 151	1, 240	1, 326	1, 481
Paraffin……do	36	40	39	56	60
Feedstocks for petroleum chemical plants……do	946	488	1, 130	1, 502	1, 566
Miscellaneous products……do	([4])	346	247	258	245
Total……do	40, 933	45, 629	48, 900	49, 592	54, 575

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] Does not include lead refined from imported bullion.
[2] Includes fluorspar recovered from old lead and zinc mine dumps.
[3] Includes petroleum gases.
[4] Included with feedstocks to chemical plants.

FOREIGN TRADE

Gross exports of United Kingdom products in 1964 were valued at about $11.91 billion, an increase of 4.2 percent over those of 1963; exports of the mineral based commodities were valued at $2 billion, an increase of 3 percent over those of 1963. Greater increases were shown, however, in the exports of iron and steel (about 9 percent in quantity and 6.5 percent in value) and in nonmetals (about 20 percent in quantity and 11.1 percent in value). Exports of nonferrous base metals decreased about 5 percent in quantity but showed an increase of about 11 percent in value, reflecting increased nonferrous metal prices as well as emphasis on the export of semimanufactures. Of the groups listed, the European Economic Community (EEC) received slightly more than 25 percent, the Commonwealth countries slightly less than 25 percent, and European Free Trade Association (EFTA) 18 percent. The United States accounted for 6 percent of the mineral based commodity exports.

TABLE 2.—United Kingdom: Foreign trade by major commodity groups

(Thousand dollars)

Commodity group	1963	1964							
		Total	Areas of consignment						
			EEC	EFTA	East Europe	British Common-wealth and Ireland	Other Europe	United States	All other
Exports:									
Metals:									
Metalliferous ores and scrap	45,653	40,346	12,960	-----	-----	2,764	-----	108	24,514
Iron and steel	572,491	609,654	93,120	88,791	14,831	176,940	48,348	42,090	145,534
Nonferrous metals (except gold)	348,049	387,458	142,365	50,561	9,580	81,089	14,678	32,846	56,339
Nonmetals:									
Crude	49,623	53,010	22,198	9,024	-----	8,662	2,932	3,128	7,066
Manufactures:									
Fertilizers	13,721	16,487	-----	-----	-----	12,178	-----	-----	4,309
Other	189,582	211,415	36,469	21,447	-----	88,017	5,540	21,941	38,001
Chemical elements and compounds [1]	260,051	289,827	75,235	30,598	15,127	76,125	10,259	16,832	65,651
Mineral fuels:									
Coal, coke and briquets	133,756	103,429	54,032	33,542	-----	8,317	884	-----	6,654
Petroleum and petroleum products	325,967	282,798	70,855	134,266	-----	41,270	7,876	-----	28,531
Mineral tars and crude chemicals	8,364	10,585	-----	-----	-----	2,646	-----	3,381	4,558
Other	1,471	2,276	(2)	(2)	(2)	(2)	(2)	(2)	[3] 2,276
Total minerals and metals	1,948,728	2,007,285	507,234	368,229	39,538	498,008	90,517	120,326	383,433
All other commodity groups	9,478,725	9,904,223	1,850,588	1,176,013	238,195	3,007,792	490,596	876,551	2,264,488
Total exports	11,427,453	11,911,508	2,357,822	1,544,242	277,733	3,505,800	581,113	996,877	2,647,921
Reexports	430,667	429,692	181,038	46,871	12,980	77,070	10,933	63,879	36,921
Total, gross exports	11,858,120	12,341,200	2,538,860	1,591,113	290,713	3,582,870	592,046	1,060,756	2,684,842

Imports:									
Metals:									
Metalliferous ores and scrap	402,941	518,269	13,266	83,562	6,448	181,380	8,166	17,680	207,767
Iron and steel	209,897	297,155	103,641	72,471	13,933	36,633	------	36,571	33,906
Nonferrous metals (except gold)	656,224	919,883	44,388	59,040	23,419	522,455	2,049	143,769	124,763
Nonmetals:									
Crude	110,233	126,242	22,981	7,752	------	42,969	1,005	12,515	39,020
Manufactures:									
Fertilizers	56,236	52,720	37,096	------	9,356	494	2,428	------	3,346
Other	65,392	84,352	40,480	8,771	2,946	9,900	------	10,310	11,945
Chemical elements and compounds [1]	215,253	279,190	107,854	39,342	3,944	36,918	5,844	63,839	21,449
Mineral fuels:									
Coal, coke and briquets	1,648	1,520	------	------	------	1,415	------	------	105
Petroleum and petroleum products	1,558,300	1,632,615	198,211	------	1,329	267,087	------	23,014	1,142,974
Other	6,704	8,620	(2)	(2)	(2)	(2)	(2)	(2)	[2] 8,620
Total minerals and metals	3,282,828	3,920,566	567,917	270,938	61,375	1,099,251	19,492	307,698	1,593,895
All other commodity groups	10,192,850	11,517,128	1,995,510	1,463,571	460,301	3,694,330	628,216	1,483,935	1,791,265
Total imports	13,475,678	15,437,694	2,563,427	1,734,509	521,676	4,793,581	647,708	1,791,633	3,385,160

[1] Grouping as reported is not readily divisible between "metals" and "nonmetals."
[2] Distribution not available.

The value of gross imports rose to $15.44 billion in 1964, of which about $3.92 billion was accounted for by mineral-based commodity groups. Sharp increases were shown in the imports of mineral raw materials and crude metals to meet the increased domestic requirements and to maintain a certain share in the export market for manufactures. Iron and steel imports increased by 35 percent in volume and nearly 42 percent in value while nonferrous metal imports rose 17 percent in volume and 40 percent in value. Increase in the volume of nonmetallics imported is estimated at 66 percent, with a 29-percent increase in value. British Commonwealth countries and Ireland supplied about 28 percent in value of the United Kingdom imports, the EEC countries 14.5 percent, and the EFTA 6.9 percent. The United States supplied 7.8 percent, in value, of the United Kingdom's mineral and metal imports.

TABLE 3.—United Kingdom: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Aluminum oxide and hydroxide	804	984	NA.
Metal:			
Unwrought	r 5,438	7,575	Netherlands 1,459; Sweden 1,353; Australia 1,025.
Semimanufactures	r 60,099	56,722	Ghana 7,262; Canada 5,842; Sweden 3,117.
Arsenic, white	8,297	NA	NA.
Bismuth	519	613	NA.
Chromium	275	449	NA.
Cobalt oxides and hydroxides	338	366	NA.
Copper and copper alloys:			
Unwrought	157,940	86,908	Belgium-Luxembourg 22,128; Italy 18,136; Wext Germany 13,448; Netherlands 7,089.
Semimanufactures	r 63,667	56,715	United States 7,108; New Zealand 5,045; Ireland 4,061; Netherlands 3,276; Republic of South Africa 3,257; Australia 2,694; Spain 2,599; Portugal 2,305; Israel 2,095.
Gold:			
Bullion, refined. thousand troy ounces	28,968	18,986	NA.
Gold coin do	761	949	NA.
Iron and steel:			
Scrap thousand tons	1,102	1,081	Italy 287; Japan 181; Spain 150; France 104.
Pig iron and ferroalloys do	229	113	West Germany 46; Belgium-Luxembourg 15; Italy 11.
Steel ingots and other primary forms. do	r 89	44	Spain 7; West Germany 6; India 6; Switzerland 4.
Wire rod thousand tons	76	103	United States 55; U.S.S.R. 12; Ireland 8; Belgium-Luxembourg 8.
Other bars and rods do	300	255	U.S.S.R. 42; Netherlands 15; Sweden 11; Ireland 10; Norway 10; Denmark 9; West Germany 8.
Angles, shapes and sections:			
Heavy thousand tons	240	279	United States 71; Australia 26; New Zealand 24; Canada 24; Netherlands 13.
Light do	55	49	United States 9; Ireland 7; New Zealand 5; Australia 3.
Plates and sheets:			
Heavy, including universals. do	368	223	Norway 36; France 27; Belgium-Luxembourg 23; Canada 18; India 15; Italy 13; Sweden 12; Yugoslavia 8.
Medium do	30	57	France 13; West Germany 8; Sweden 6; Norway 5.
Thin.			
Uncoated do	56	929	U.S.S.R. 232; Italy 106; Sweden 63; West Germany 62.

See footnotes at end of table.

TABLE 3.—United Kingdom: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals—Continued			
Iron and steel—Continued			
Plates and sheets—Continued			
Thin—Continued			
Coated:			
Tinned plates and sheets .... thousand tons	474	465	United States 54; Republic of South Africa 54; Argentina 46; Italy 38; Spain 37; Sweden 27; mainland China 15; Norway 15.
Other .... do	103	156	Finland 19; mainland China 13; Norway 10; New Zealand 9; Nigeria 9.
Hoop and strip .... do	98	161	Turkey 38; West Germany 15; Sweden 13; India 11.
Railway track material .... do	125	96	Belgium-Luxembourg 15; Nigeria 11; Italy 11; India 10; Sierra Leone 9.
Wire .... do	114	117	United States 25; Canada 15; New Zealand 12; India 8.
Tubes, pipes and fittings .... do	537	513	United States 71; Canada 31; Netherlands 28; Trinidad 25.
Crude castings .... do	3	15	Netherlands 4; Sweden 2; Italy 2.
Lead and lead alloys:			
Lead oxides	3,991	4,136	NA.
Metal:			
Unwrought	36,222	42,926	West Germany 29,007; United States 4,014; Turkey 1,302.
Semimanufactures	2,077	1,982	NA.
Magnesium and magnesium alloys:			
Unwrought	1,975	1,751	NA.
Semimanufactures	70	189	NA.
Mercury (reexports) .... 76-pound flasks	5,774	3,833	Sweden 557; Republic of South Africa 489; France 442; India 310; Denmark 300.
Nickel and nickel alloys:			
Nickel oxide	484	488	NA.
Metal:			
Unwrought	[r] 20,451	23,970	West Germany 7,206; France 4,209; Italy 3,463.
Semimanufactures	[r] 5,650	6,446	France 828; Italy 755; Sweden 612; Netherlands 383; United States 365.
Platinum and platinum-group metals .... troy ounces	571,319	866,173	United States 290,032; Canada 212,741; Japan 116,000; West Germany 90,536.
Silver and silver alloys, unwrought and semimanufactures .... thousand troy tons	28,941	[r] 21,443	Italy 6,339; France 2,296; West Germany 2,009; Netherlands 1,667.
Tin:			
Tin oxides .... long tons	531	467	NA.
Metal and alloys unwrought and semimanufactures .... do	9,964	11,496	United States 2,065; U.S.S.R. 1,900; France 1,307; Netherlands 1,111; West Germany 717.
Zinc:			
Zinc oxides	490	357	NA.
Metal and alloys:			
Unwrought	7,139	8,941	United States 3,558; Japan 2,033; Italy 1,068.
Semimanufactures	7,348	4,401	Netherlands 811; Republic of South Africa 416; Canada 364; France 263.
Nonferrous base metals, n.e.s.:			
Ores and concentrates, n.e.s.	18,151	13,677	Belgium-Luxembourg 2,637; Italy 1,996; Netherlands 1,778; West Germany 1,560; Spain 1,118.
Scrap	143,757	34,399	Canada 9,675; Belgium-Luxembourg 6,524; West Germany 5,290.
Metals:			
Magnesium and beryllium	2,047	1,960	West Germany 1,092; France 262.
Tungsten, molybdenum, and tantalum.	4,672	84	Italy 10; West Germany 7.
Other	95,537	3,433	United States 1,700; France 498; Sweden 132; West Germany 125.
Nonmetals:			
Abrasives, natural, n.e.s.	2,077	4,066	Australia 938; Republic of South Africa 548.

See footnote at end of table.

TABLE 3.—United Kingdom: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Nonmetals—Continued			
Asbestos:			
Crude or simply processed	7,127	8,248	United States 2,478; Canada 1,284; West Germany 918; Italy 597.
Asbestos or cellulose fiber cement products, unfired.	232,734	58,095	Nigeria 6,559; Sudan 6,133; Ghana 4,176; Ireland 3,883.
Cement, hydraulic thousand tons	379	313	Nigeria 52; Ghana 23; Spain 21; Australia 19; Sierra Leone 15; Bermuda 13; Mauritius 13; Canada 11; Kuwait 10.
Clay and other refractory minerals, n.e.s. do	1,430	1,591	West Germany 264; Italy 241; France 174; Sweden 151; Finland 151.
Clay and refractory construction materials. do	186	205	Australia 23; Canada 22; Netherlands 15; Ireland 14.
Fertilizer materials:			
Nitrogenous do	366	394	Ceylon 153; Federation of Malaya 62 India 50; Mauritius 32.
Other do	9	15	Belgium-Luxembourg 9.
Lime	23,177	25,195	Ghana 4,448; Nigeria 4,277.
Salt thousand tons	325	368	Sweden 99; Nigeria 82; Ireland 32; New Zealand 28.
Stone, sand and gravel do	20	164	West Germany 74; Ireland 35.
Cut stone	3,425	2,004	NA.
Other crude nonmetallic minerals:			
Quartz, mica, feldspar, fluorspar, and cryolite.	2,847	9,531	Australia 1,103.
Other, n.e.s. thousand tons	85	170	Norway 95; United States 10; Ireland 5.
Other nonmetal manufactures	54,971	63,288	Ireland 7,966; Sweden 5,396; Italy 4,749; Australia 3,226; West Germany 3,155; Netherlands 2,990; Republic of South Africa 2,574; Norway 2,394; India 2,382; Belgium-Luxembourg 2,282.
Strontium minerals (celestite)	[r] 3,580	9,588	NA.
Mineral fuels:			
Coal thousand tons	4,786	8,002	France 2,119; Netherlands 1,884; Denmark 896; Belgium-Luxembourg 866; West Germany 600; Ireland 533; Spain 293; Sweden 209.
Coal and coke do	1,754	2,051	Norway 627; Denmark 323; Sweden 235; Portugal 171.
Briquets do	102	138	France 53; Belgium-Luxembourg 31; Netherlands 24.
Carbon black do	38	39	NA.
Petroleum:			
Crude and partly refined. thousand barrels	7,368	10,523	Netherlands 10,353.
Refinery products:			
Gasoline do	14,693	12,138	Sweden 3,137; Denmark 3,110; France 1,805; Norway 1,736.
Kerosine do	6,970	7,029	NA.
Distillate fuel oil do	23,450	26,105	Sweden 15,029; Denmark 10,108; West Germany 7,173; Norway 5,996; Netherlands 4,075; Ireland 1,185.
Residual fuel oil do	21,743	20,844	
Lubricating oils do	3,666	3,654	India 333; Belgium-Luxembourg 293; West Germany 236; Netherlands 225; Republic of South Africa 210; Australia 178; New Zealand 171; Norway 138; Sweden 107; Finland 100.
Mineral jelly and waxes	6,745	8,923	West Germany 2,344; Republic o South Africa 1,453; France 431.
Other products of coal, petroleum, and natural gas:			
Asphalt and bituminous mixtures. thousand tons	69	49	NA.
Coal tar pitch do	213	296	NA.
Electric energy million kilowatt-hours	15	121	NA.

[r] Revised. NA Not available.

TABLE 4.—United Kingdom: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal source, 1963
Metals:			
Aluminum:			
Bauxite .... thousand tons	433	337	Ghana 206; Greece 64; France 55; British Guiana 11.
Metal, unalloyed and alloys:			
Scrap	8,572	9,367	United States 4,547; U.S.S.R. 3,439; Ireland 809.
Ingot and equivalent forms	r 255,239	270,631	Canada 147,681; United States 49,832; Norway 45,740; U.S.S.R. 14,631; Switzerland 5,054; Australia 3,542.
Semimanufactures	r 23,016	25,649	Belgium-Luxembourg 11,776; United States 3,912; Austria 3,149; Ireland 1,379.
Antimony ore, concentrate and crude antimony.	12,330	12,188	NA.
Arsenic, white	6,688	8,951	NA.
Bismuth:			
Metal	537	428	NA.
Alloys	354	282	NA.
Cadmium and sponge	1,196	1,425	Canada 576; Australia 260: United States 226; U.S.S.R. 139.
Chromite	118,383	162,594	Philippines 79,820; Republic of South Africa 49,431.
Cobalt	1,264	387	NA.
Columbium, tantalum ores and concentrates.	796	821	NA.
Copper and copper alloys:			
Scrap	1,325	2,173	NA.
Unwrought:			
Blister	105,653	101,112	Zambia 50,255; Chile 37,948; Peru 12,807.
Electrolytic	r 398,448	358,442	Zambia 175,824; Canada 96,268; United States 28,863; Chile 27,216.
Fire refined	r 31,404	41,216	Chile 35,162; West Germany 4,084; Republic of South Africa 1,270.
Brass and bronze	79	1,566	NA.
Semimanufactures	r 3,967	4,281	NA.
Gold:			
Ores, concentrates, jewelers sweepings, etc., estimated gold content. ... troy ounces	r 59,000	57,000	NA.
Bullion, unrefined and refined, gold content. ... thousand troy ounces	34,082	34,299	NA.
Gold coin .... troy ounces	554,929	419,331	NA.
Other gold .... do	2,372	3,099	NA.
Semimanufactures, estimated gold content. ... do	----------	460	NA.
Iron and steel:			
Iron ore and concentrates. ... thousand tons	13,120	14,551	Sweden 4,706; Canada 2,397; Venezuela 1,240; Liberia 1,105; Brazil 763; Sierra Leone 545; Spain 529; Norway 518.
Slag, scale, dross, etc .... do	NA	23	Sweden 19.
Scrap .... do	5	5	NA.
Pig iron, including shot and sponge iron. ... do	r 141	201	Norway 79; Finland 25; U.S.S.R. 25; West Germany 23.
Ferroalloys:			
Ferromanganese .... do	45	55	Republic of South Africa 36; Norway 7; France 5.
Ferrochromium .... do	25	35	Norway 76; Canada 22; Sweden 9; U.S.S.R. 9; Republic of South Africa 9.
Ferrosilicon, ferrosilicochrome. ... do	80	93	
Silico-manganese .... do	25	28	NA.
Other .... do	2	3	NA.
Steel ingots and other primary forms. ... do	160	261	Canada 106; France 59; Australia 29; Netherlands 20.
Coils for rerolling .... do	270	246	U.S.S.R. 203; Canada 15; Australia 11; Netherlands 9.
Semimanufactures:			
Wire rod .... do	23	80	Belgium-Luxembourg 34; Sweden 16; Norway 11.
Other bars and rods ...... do	95	174	Belgium-Luxembourg 89; France 35; Sweden 19; Norway 15.
Angles, shapes and sections. ... do	r 9	28	Belgium-Luxembourg 12; West Germany 5; Netherlands 1.

See footnotes at end of table.

TABLE 4.—United Kingdom: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal source, 1963
Metals—Continued			
Iron and steel—Continued			
Semimanufacres—Continued			
Plates and sheets:			
Heavy plate, including universals. thousand tons	12	23	Sweden 10; Republic of South Africa 7.
Medium plate do	18	47	Australia 24; Republic of South Africa 16.
Thin plates and sheets:			
Uncoated do	154	295	Netherlands 157; Austria 31; Republic of South Africa 23.
Coated do	10	17	NA.
Hoop and strip do	11	13	United States 5; Belgium-Luxembourg 3; West Germany 2; Sweden 2.
Wire do	5	6	Sweden 2; United States 1; Ireland 1.
Tubes, pipes and fittings. do	15	16	Sweden 7; West Germany 3.
Rough castings and forgings. do	----------	1	Mainly from Norway and Ireland.
Lead and lead alloys:			
Ores and concentrates, lead content	27,075	25,812	Australia 12,035; Canada 4,789.
Scrap	2,138	1,680	NA.
Bullion	[r] 47,094	58,936	Australia 58,936.
Refined	[r] 136,575	124,378	Australia 71,716; Canada 40,775.
Lithium minerals	3,450	3,250	NA.
Magnesium:			
Metal and alloys	[r] 5,618	4,133	NA.
Magnesium chloride	5,009	4,038	NA.
Manganese ore and concentrate. thousand tons	348	310	U.S.S.R. 108; Republic of South Africa 94; India 73.
Mercury 76-pound flasks	20,725	24,567	NA.
Molybdenum ore and concentrate	5,604	5,887	NA.
Nickel:			
Ore and concentrate	----------	5	NA.
Matte and speiss	54,574	62,620	Canada 62,486; Sweden 133.
Metal:			
Scrap	2,389	2,533	United States 829; Netherlands 676; France 348.
Unwrought	[r] 13,653	13,336	Canada 7,486; Norway 3,730; United States 927; Republic of South Africa 760.
Semimanufactures	[r] 4,227	3,144	West Germany 1,656; United States 779; Canada 634.
Platinum and platinum-group metals:			
Ores and concentrates, including those of uranium and thorium	33,149	2,515	NA.
Metals unwrought or semimanufactures. troy ounces	100,775	85,669	U.S.S.R. 39,385; Italy 29,739; Austrai 6,398; United States 2,861; Hong Kong 2,186.
Selenium kilograms	112,809	129,827	NA.
Silicon	8,161	8,990	NA.
Silver:			
Ore and concentrate	109	135	NA.
Unwrought and semimanufactures. thousand troy ounces	[r] 40,028	21,517	United States 6,600; Mexico 5,090; Peru 3,370; Republic of South Africa 1,802; Burma 1,005; Australia 728; Singapore 594; Hong Kong 485.
Tin:			
Ores and concentrates long tons tin content.	17,432	16,205	Bolivia 14,523.
Metal:			
Refined tin, unwrought do	9,232	7,927	Nigeria 5,609; mainland China 1,158; Malaysia 886.
Other do	----------	45	NA.
Titanium ores and concentrates:			
Ilmenite	280,328	230,490	NA.
Other	15,980	18,563	NA.
Tungsten ore and concentrate	5,755	5,425	South Korea 1,077; U.S.S.R. 585; Burma 572; Portugal 572; mainland China 562; Bolivia 550; Czechoslovakia 282; Peru 266; Australia 250.

See footnotes at end of table.

TABLE 4.—United Kingdom: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal source, 1963
Metals—Continued			
Zinc:			
Ore and concentrate, zinc content	94,825	104,728	Australia 80,721; Canada 11,677.
Metal and alloys:			
Scrap	NA	2,980	West Germany 825; Netherlands 605.
Slab zinc, unwrought:			
High purity	65,985	79,738	Canada 33,173; Australia 13,614; Republic of the Congo 7,267.
Electrolytic	47,755	61,844	Canada 22,690; Australia 13,940; Bulgaria 9,975; U.S.S.R. 9,328.
Other	33,020	21,176	Canada 19,034.
Total	146,760	162,758	
Semimanufactures	1,021	861	NA.
Zirconium ore and concentrate	33,453	32,897	NA.
Nonferrous base metals, n.e.s.:			
Magnesium and beryllium	5,651	4,194	Canada 3,356; United States 509; Norway 280.
Tungsten, molybdenum, tantalum	63	93	Austria 68.
Other	6,044	6,866	United States 1,703; Republic of South Africa 932; Canada 717; Japan 683; Belgium-Luxembourg 624; mainland China 539.
Nonmetals:			
Abrasives:			
Natural:			
Infusorial and other siliceous earths (diatomite).	64,707	54,569	NA.
Pumice, emery, natural corundum and other.	[r] 11,240	12,289	NA.
Artificial:			
Artificial corundum, crude, ground, or graded.	12,627	14,256	NA.
Carborundum	13,965	11,693	NA.
Silicon carbide	15,046	12,026	NA.
Asbestos:			
Crude	147,402	160,082	Canada 73,638; Republic of South Africa 43,284; Federation of Rhodesia and Nyasaland 39,378; U.S.S.R. 1,377; Cyprus 1,273.
Asbestos-cement and cellulose fiber cement products.	17,283	24,357	NA.
Barite	27,897	28,482	NA.
Boron:			
Crude minerals	21,938	26,285	NA.
Borax	21,842	21,389	NA.
Boric acid	3,533	NA	NA.
Cement, hydraulic.....thousand tons	390	247	Ireland 194; Poland 29; Iceland 12.
Clays and refractories:			
Crude:			
Andalusite, kyanite, sillimanite, mullite dinas, and chamotte.	31,823	19,848	NA.
Other	43,575	42,292	NA.
Manufactures:			
Refractory construction materials.	22,061	34,034	Austria 14,000; Denmark 8,147; United States 4,463.
Brick and nonrefractory products.	18,954	19,921	Belgium-Luxembourg 5,816; West Germany 3,217; Japan 2,941; Sweden 2,570.
Dolomite	NA	10,212	NA.
Feldspar	37,173	36,880	NA.
Fertilizer materials:			
Nitrogenous:			
Natural sodium nitrate	15,445	13,561	All from Chile.
Manufactured	204,496	394,051	Ceylon 152,798; Malaya 61,724; India 49,814; Mauritius 32,410.

See footnotes at end of table.

TABLE 4.—United Kingdom: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal source, 1963
Nonmetals—Continued			
Fertilizer materials—Continued			
Phosphates:			
Phosphate rock thousand tons	1,422	1,436	Morocco 831; United States 259; Oceania 229; U.S.S.R. 49; Tunisia 30; Senegal 28.
Basic slag	78	98	Belgium-Luxembourg 81; Netherlands 22; France 21.
Superphosphates	26	26	
Potash:			
Salts, crude natural	----------	29,165	West Germany 17,990; East Germany 9,775.
Potassium chloride. thousand tons	678	691	France 198; West Germany 198; East Germany 160; Spain 54.
Potassium sulfate	24,551	28,355	NA.
Potassium nitrate	3,489	2,838	NA.
Graphite, natural	8,943	8,188	NA.
Gypsum and anhydrite, crude and calcined. thousand tons	135	142	NA.
Magnesite, natural	47,618	38,051	NA.
Mica:			
Block, films, splittings, and waste	6,082	11,561	NA.
Mica manufactures	NA	37	NA.
Pyrites, unroasted thousand tons	286	204	Cyprus 136; Spain 29; U.S.S.R. 26; Canada 12.
Salt, for fisheries and channel islands. do	43	179	Tunisia 60; West Germany 49; Spain 34; Italy 22; Poland 12.
Stone, sand and gravel:			
Marble and other calcareous stone. do	26	26	NA.
Natural sands (excluding mineral bearing sand). do	190	200	NA.
Other do	----------	291	
Total do	216	517	Ireland 180; Belgium-Luxembourg 157; France 64; Italy 58; Netherlands 39.
Sulfur do	521	565	United States 248; France 194; Mexico 115.
Talc and soapstone	44,286	45,193	NA.
Mineral fuels:			
Coal, coke, and briquets. thousand tons	78	66	Ireland 64.
Peat and briquets do	----------	64	Ireland 63.
Carbon black do	[r] 14	12	NA.
Petroleum:			
Crude and partly refined. thousand barrels	388,220	401,200	Kuwait 158,056: Iraq 63,827: Venezuela 42,112: Iran 22,704; Nigeria 17,321; Saudi Arabia 14,514; Bahrain, Qatar and Trucial States 14,181; Netherlands 7,089; Netherlands Antilles 3,765.
Refinery products:			
Gasoline do	23,401	27,004	Netherlands 5,420: Trinidad 4,554: Bahrain, Qatar and Trucial States 3,551: Netherlands Antilles 1,845; France 1,554; Italy 1,415; Venezuela 1,401.
Kerosine do	13,046	16,799	Aden 3,965; Netherlands 2,493; Bahrain, Qatar and Trucial States 2,405; Netherlands Antilles 1,824.
Distillate fuel oil do	18,208	25,499	Venezuela 15,747; Trinidad 12,788; Netherlands 11,313; Netherlands Antilles 8,140; Kuwait 6,081; Bahrain, Qatar and the Trucial States 4,966; Italy 4,438.
Residual fuel oil do	50,157	56,152	
Lubricating oils do	3,585	3,792	United States 1,442; Netherlands Antilles 940; Venezuela 381.
Mineral jelly and waxes. thousand tons	885	810	Indonesia 704; Netherlands Antilles 31; Netherlands 20; United States 14.
Petroleum coke do	60	69	NA.
Petroleum jelly and wax do	888	810	Indonesia 704.
Petroleum coke do	60	69	NA.
Electric energy million kilowatt-hours	102	110	NA.

[r] Revised. NA Not available.

COMMODITY REVIEW

METALS

Iron and Steel.—The output of 17.6 million tons of pig iron and 26.7 million tons of crude steel in 1964 exceeded the previous high recorded production of each, established in 1960, by 9.6 percent and 7.9 percent, respectively. Crude steel output represented about 90 percent of capacity, which was estimated at about 29.5 million metric tons at yearend. Average utilization during 1963 was estimated at 79 percent. Consumption of 16.4 million tons of finished steel in 1964 also established a new record.

TABLE 5.—United Kingdom: Salient iron and steel statistics

(Thousand metric tons unless otherwise specified)

	1960	1961	1962	1963[1]	1964
IRON ORE					
Production by field and type:					
Lancashire, Cumberland and Glamorgan hematite, 49 percent Fe	441.9	420.7	384.3	400.2	434.0
Frodingham ironstone (including Claxby), 21 percent Fe	5,498.5	5,636.9	5,604.5	5,353.4	5,528.2
Cleveland oolite, 28 percent Fe	470.3	450.8	263.7	143.3	.8
South Lincolnshire and Leicester marlstone, 25 percent Fe	805.8	628.5	480.1	353.9	711.8
Oxford and S.W. Northamptonshire marlstone, 22 percent Fe	1,349.7	1,014.7	788.1	917.2	902.9
Northampton sand ironstone, 31 percent Fe	8,795.4	8,631.5	8,001.6	7,983.3	9,010.0
Total,[1] 27 percent Fe	17,361.6	16,783.1	15,522.3	15,151.3	16,587.7
Consumption:					
In blast furnaces:					
Domestic iron ore	7,496.1	6,541.2	4,756.4	3,463.0	3,843.8
Imported iron ore, 58 percent Fe [2]	7,915.3	6,937.3	4,994.9	4,987.2	5,626.6
Imported manganese ore	479.1	354.1	387.0	294.4	415.2
Total	15,890.5	13,832.6	10,138.3	8,744.6	9,885.6
In sinter plants:					
Domestic iron ore	9,840.8	10,201.3	10,793.2	11,765.8	12,672.2
Imported iron ore, 58 percent Fe [2]	7,113.8	6,795.6	7,271.6	8,614.7	11,107.7
Imported manganese ore	---------	8.1	8.6	13.2	14.1
Total	16,954.6	17,005.0	18,073.4	20,393.7	23,794.0
In steelworks:					
Domestic iron ore	11.3	11.0	8.6	8.4	7.9
Imported iron ore, 64 percent Fe [2]	1,369.4	1,197.0	977.3	906.9	1,158.3
Imported manganese ore	.1	.2	.6	1.0	---------
Total	1,380.8	1,208.2	986.5	916.3	1,166.2
Total:					
Domestic iron ore, 27 percent Fe [1]	17,348.2	16,753.5	15,558.2	15,237.3	16,523.9
Imported iron ore, 58 percent Fe [2]	16,398.5	14,929.9	13,243.8	14,508.8	17,892.5
Imported manganese ore; 9 percent Fe, 44 percent Mn [2]	479.2	362.4	396.2	308.7	429.3
Grand total	34,225.9	32,045.8	29,198.2	30,054.8	34,845.7
SCRAP					
Arisings from own works	8,888.9	8,216.4	7,896.9	8,585.2	9,998.0
Purchased (domestic and imported)	10,067.4	9,041.5	7,956.4	9,057.1	10,611.8
Consumption	18,349.4	16,993.1	15,912.2	17,469.2	19,895.5
Stocks at end of year	1,645.8	1,590.3	1,228.5	1,084.4	1,342.1

See footnotes at end of table.

TABLE 5.—United Kingdom: Salient iron and steel statistics—Continued

(Thousand metric tons unless otherwise specified)

	1960	1961	1962	1963[1]	1964
SINTER					
Production of sinter	15,023.8	14,840.6	15,940.7	18,053.9	21,363.2
Average materials consumed per ton of sinter produced:					
Domestic iron ore ... kilograms	655.0	687.5	675.0	649.7	592.0
Imported iron ore ... do	473.5	458.5	456.5	477.9	520.5
Pyrites residue and purple ore ... do	56.0	49.0	43.0	33.4	36.5
Other iron-bearing materials[3] ... do	83.0	84.0	82.0	81.9	77.5
Limestone and sandstone ... do	47.5	53.0	57.5	52.1	55.0
Coke breeze and anthracite ... do	96.5	100.5	103.0	101.6	98.5
Total ... do	1,411.5	1,432.5	1,417.0	1,396.6	1,380.0
PIG IRON					
Production of pig iron by type:					
Hematite	1,206.2	1,155.1	889.8	829.9	972.1
Basic	13,281.9	12,452.4	11,754.0	12,847.3	15,311.2
Forge and foundry	[r] 1,319.2	1,215.4	1,070.9	1,022.0	1,096.4
Blast furnace ferroalloys	208.6	160.9	197.2	126.4	171.1
Total[4]	16,015.9	14,983.8	13,911.9	14,825.6	17,550.8
Average number of furnaces in blast, number of units	85	82	73	64	67
Average annual output per furnace	188.4	182.7	189.8	232.3	261.1
Average materials consumed per ton of pig iron produced:					
Domestic iron ore, as charged ... kilograms	459.0	430.5	338.0	232.0	217.5
Average Fe content ... percent	27	27	27	27	27
Imported iron ore, as charged ... kilograms	494.0	463.0	359.0	336.5	320.5
Average Fe content ... percent	56	55	58	59	59
Imported manganese ore ... kilograms	30.0	23.5	28.0	20.0	23.5
Average Fe content ... percent	10	8	9	8	9
Sinter ... kilograms	938.5	992.0	1,143.0	1,208.0	1,216.5
Scrap ... do	92.5	93.5	103.5	104.5	96.5
Other Fe bearing materials[5] ... do	106.0	111.5	102.5	89.0	78.0
Limestone and dolomite ... do	154.0	139.5	114.0	96.5	89.5
Total ... do	2,274.0	2,253.5	2,188.0	2,086.5	2,042.0
Consumption of pig iron:					
In ironworks and iron foundries	1,951.0	1,779.5	1,575.1	1,596.9	1,797.6
In steelworks and steel foundries	14,129.3	12,857.8	12,300.8	13,502.1	15,892.9
Total	16,080.3	14,637.3	13,875.9	15,099.0	17,690.5
CRUDE STEEL					
Production by type:					
Open hearth:					
Acid	668.7	620.3	452.6	389.7	426.0
Basic	20,193.7	[r] 18,053.5	[r] 16,535.9	16,994.0	18,359.6
Bessemer:					
Acid	299.1	258.1	[r] 196.1	217.1	295.0
Basic (including Linz-Donawitz and Kaldo)	1,707.7	[r] 1,726.3	[r] 2,046.0	3,090.7	4,503.4
Electric:					
Arc	1,564.5	1,531.4	1,393.3	1,986.8	2,835.6
Induction	148.0	143.0	111.1	123.4	150.3
Stock converter and Tropenas	113.4	108.0	84.9	79.9	81.0
Total	24,695.1	22,440.6	20,819.9	22,881.6	26,650.9
Of which:					
Ingots	24,101.1	21,845.4	20,320.0	22,385.4	26,068.3
Steel for castings	594.0	595.2	499.9	496.2	582.6
Average materials consumed per ton of crude ingots and castings produced:					
Pig iron:					
Molten ... kilograms	462.5	473.0	497.5	512.0	521.5
Cold ... do	109.5	100.0	93.0	78.0	74.5
Scrap:					
Cast iron ... do	24.5	22.0	21.5	21.0	19.5
Steel ... do	496.0	497.0	489.5	496.5	490.0
Oxides ... do	70.5	69.5	64.0	57.5	59.5
Finishings ... do	16.5	17.5	16.5	16.5	17.0
Fluxes ... do	93.0	94.5	94.5	91.5	88.0
Fettling materials ... do	29.0	27.0	25.0	23.5	22.0
Total	1,301.5	1,300.5	1,301.5	1,296.5	1,292.0

See footnotes at end of table.

TABLE 5.—United Kingdom: Salient iron and steel statistics—Continued

(Thousand metric tons unless otherwise specified)

	1960	1961	1962	1963[1]	1964
FINISHED STEEL					
Production, all qualities:[6]					
Heavy rails and accessories	570.9	519.5	342.1	292.7	375.2
Plates, 3-mm thick and over	2,927.2	[r]2,825.1	[r]2,327.3	2,594.4	3,405.5
Heavy bars and sections, excluding alloy	2,840.9	[r]2,605.6	2,203.4	2,409.7	2,857.3
Wire rods and other bars and rods in coils	1,543.4	1,388.6	1,409.6	1,496.7	1,712.8
Arches, light rails and accessories	421.4	381.8	340.8	360.1	366.1
Other light-rolled sections and hot-rolled bars	3,179.2	2,927.2	2,577.1	2,610.4	3,241.6
Bright steel bars	583.6	534.4	468.9	506.9	633.5
Hot-rolled strip, excluding alloy	[r]1,763.6	[r]1,443.3	[r]1,485.3	[r]1,689.6	1,878.3
Cold-rolled strip	550.8	456.7	432.7	505.8	599.0
Sheets, coated and uncoated	2,874.0	2,564.7	2,955.4	3,632.9	4,096.3
Tinplate (including black plate for sale as such)	1,254.2	1,094.7	1,218.1	1,225.6	1,204.6
Tubes, pipes and fittings	1,363.2	1,263.8	1,221.3	1,254.6	1,452.4
Tires, wheels, axles, and rings	163.1	139.4	115.3	77.0	92.8
Forgings (excluding drop forgings)	207.4	221.7	174.6	170.5	205.9
Castings	303.7	306.3	266.0	257.1	307.4
Consumption:					
By product:					
Plates	2,351.0	2,340.8	2,128.5	2,210.7	2,657.9
Sheets	2,630.1	2,351.0	2,499.6	2,777.9	3,029.1
Tinplate, terneplate and blackplate	683.0	667.8	713.3	775.5	791.6
Other steel	9,489.7	9,119.3	8,553.7	8,788.6	9,971.1
Total	15,153.8	14,478.9	13,895.1	14,552.7	16,449.7
Stocks of mill products at end of year:					
Held by producers:					
Ingots and semis	1,707.6	1,674.8	1,650.9	1,645.2	1,748.2
Finished steel	1,037.6	984.3	1,088.1	1,285.2	1,307.2
Held by consuming industries and stockholding merchants:					
Plates	822.5	859.8	614.5	631.3	761.0
Sheets	939.5	727.9	644.6	631.5	712.9
Tinplate, terneplate, and blackplate	176.0	162.8	157.1	165.8	168.7
Other steel	3,232.8	3,054.6	2,525.6	2,387.9	2,596.1
Total consumer and merchant stocks	5,170.8	4,805.1	3,941.8	3,816.5	4,238.7
By consuming industries:					
Coal mining	605.6	581.8	496.5	497.3	517.6
Food, drink, and tobacco	87.0	90.2	101.0	95.6	100.0
Chemical and allied industries	136.9	148.0	131.3	125.3	131.6
Iron and steel	814.9	739.5	640.1	630.0	828.7
Machinery, machine tools, and equipment	1,273.5	1,332.3	1,237.5	1,343.0	1,546.8
Ordnance, small arms, and mechanical engineering, n.e.s	533.5	450.3	452.7	486.7	549.6
Industrial plant and steelwork	1,702.3	1,880.7	1,608.2	1,637.7	1,935.5
Tools, instruments, and implements	87.1	90.4	88.4	87.8	113.6
Electrical industries	686.9	671.7	691.4	750.9	791.4
Shipbuilding	737.3	748.1	650.3	589.7	787.3
Motor vehicle manufacturing and servicing	2,298.8	1,752.1	1,942.4	2,225.4	2,406.2
Other vehicles including aircraft, manufacture and repair	162.4	140.3	130.3	131.8	130.0
Railway equipment and other transportation services	715.3	737.3	533.4	481.5	451.3
Bolts, nuts, wire, and wire manufactures	1,516.1	1,393.1	1,339.2	1,433.8	1,586.7
Other metal manufactures	2,416.8	2,379.5	2,451.2	2,608.7	2,929.2
Construction	948.8	961.1	939.1	938.5	1,080.8
Utilities	81.3	59.6	104.2	140.9	122.8
Other consumers	349.3	322.9	358.0	348.1	440.6
Total	15,153.8	14,478.9	13,895.2	14,552.7	16,449.7

---

[r] Revised.
[1] Weighted average, based on quantity of each grade consumed in 1962.
[2] Weighted average, based on quantities of each grade received in 1962.
[3] Includes burnt spent oxides and black oxides, flue dust, scale, slag, and other materials.
[4] Includes direct castings not shown in table.
[5] Includes cinder, purple ore, scale, and slag.
[6] Includes some material for conversion into other products also listed in this table.

Developments of facilities in the iron and steel industry during 1964 included commissioning of five oxygen steelworks that were under construction during 1963. These were the Linz-Donawitz (LD) and Kaldo Works of Consett Iron Co. Ltd., at Durham; the LDAC plant of the GKN Steel Company Ltd. in the firm's Lysaght's Scunthorpe Works at Scunthorpe; the new Kaldo Steelworks of Park Gate Iron and Steel Co. at Rotherham, Sheffield; the new Kaldo Steelworks of Shelton Iron and Steel Co. Ltd. at Stoke-on-Trent, Staffordshire; and the replacement of Bessemer Steelworks by an LDAC[2] converter plant in the Richard Thomas and Baldwins Ltd. plant at Ebbu Vale, Wales.

Other important projects involving modernization and replacement of melting plant and rolling mill equipment completed during 1964 included: Replacement of open-hearth steelmaking facilities by six 110-ton electric furnaces in the Steel, Peech & Tozer branch of The United Steel Companies Ltd.; completion of a new inspection depart-

TABLE 6.—United Kingdom: Consumption of principal nonferrous metals and scrap

(Metal content in metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Aluminum:					
Primary, dispatches to consumers	359,558	284,114	286,658	318,553	358,934
Secondary, dispatches to consumers	[r] 129,832	[r] 131,071	[r] 142,777	[r] 163,047	187,469
Aluminum in scrap, direct use	[r] 17,167	11,720	9,187	10,028	10,486
Total	[r] 506,557	[r] 426,905	[r] 438,622	[r] 491,628	556,889
Scrap consumed in secondary smelters	150,629	146,725	160,118	182,341	204,278
Antimony:					
In metal	3,055	2,637	2,814	2,815	2,785
In oxides	2,698	2,321	2,110	1,948	2,370
In sulfides and crude	58	63	72	59	59
In scrap, direct use	6,444	6,215	6,979	7,363	8,316
Total	12,255	11,236	11,975	12,185	13,530
Cadmium kilograms	1,413,986	1,250,351	1,276,108	[r] 1,288,707	1,366,892
Copper:					
Primary	459,042	433,565	429,997	441,160	503,360
Secondary	101,252	95,235	96,067	116,808	129,493
Copper in scrap, direct use	173,896	[r] 163,623	[r] 138,267	[r] 137,405	155,825
Total	734,190	[r] 692,423	[r] 664,331	[r] 695,373	788,678
Lead:					
Refined lead	[r] 286,481	[r] 275,718	[r] 276,339	[r] 283,493	307,766
Scrap and remelted lead	[r] 98,065	[r] 97,690	[r] 108,956	[r] 109,808	119,650
Total	[r] 384,546	[r] 373,408	[r] 385,295	[r] 393,301	427,416
Nickel, including ferronickel	27,850	26,500	25,100	[r] 27,500	38,100
Tin:					
Primary and secondary long tons	22,787	21,623	22,434	21,770	21,069
Zinc:					
Primary:					
Slab zinc	275,904	258,675	246,344	261,626	288,117
Other	3,975	2,623	2,325	1,755	941
Remelted	6,733	5,930	5,290	7,070	7,670
Scrap, zinc content	85,077	77,316	[r] 68,341	[r] 74,989	81,609
Total	371,689	344,544	[r] 322,300	[r] 345,440	378,337

[r] Revised.

Source: British Bureau of Nonferrous Metal Statistics.

---

[2] A modification of the Linz-Donawitz process adopting it to convert high phosphorous pig iron to steel.

ment and vacuum degassing system in the Brymbo Works of the GKN Steel Co., Ltd.; and completion of automatic and computer control systems in the hot strip mill of the Spencer Works of Richard Thomas and Baldwins Ltd., in Wales.

Nonferrous Metals.—The United Kingdom continued to be dependent on imported raw materials for the nonferrous metal industries, except for a small production of lead, zinc, and tin concentrates. Consumption established new highs for all of the major nonferrous base metals except tin.

Reactivation of demand for base metals stimulated interest in some of the old lead-zinc fields, and promising results were reported by Consolidated Goldfields Ltd. from drilling exploration in the Strontian lead-zinc field in Scotland.

Of the output of 1,226 long tons of tin in concentrates, it is estimated that South Crofty Mines produced about 53 percent and Geevor Mines 38 percent. Most of the remainder was produced by Hydraulic Tin Ltd. from operations in the Carnon Valley.

Several new companies involving both British and Canadian capital are either actively engaged in prospecting and exploration for new deposits or for recoverable tin in dumps and other accumulations in various parts of the tin-producing areas of Devon and Cornwall. Promising results have been reported by Cornish Explorations Ltd. from drilling at Pendarves. Western Tin Mines Ltd. has reported recoverable tin accumulations on the Red River in Cornwall, and Coastal Prospecting Ltd. is reported to be planning dredging operations in the St. Ives Bay.

TABLE 7.—United Kingdom: Energy balance

(Million tons coal or coal equivalent [1])

Energy source	1960	1961	1962	1963	1964
Coal, direct use	92.6	85.7	82.6	78.8	71.2
Coke and coke breeze	32.0	30.1	28.7	29.1	30.0
Other solid fuel	1.4	1.5	1.5	1.6	1.3
Coke oven gas	2.6	2.5	2.1	2.1	2.5
Oil, direct use	55.3	60.4	67.3	74.2	79.9
Electricity:					
Coal and coke	53.5	57.2	62.9	69.2	69.8
Oil	9.4	9.8	10.0	8.8	9.9
Nuclear electricity	.9	1.1	1.5	2.6	3.3
Hydroelectricity [2]	1.7	2.1	2.1	1.8	1.9
Total	65.5	70.2	76.5	82.4	84.9
Town gas:					
Coal	11.9	11.7	11.9	11.9	10.9
Oil and petroleum gases	1.9	2.0	2.7	3.7	5.1
Coke oven gas and colliery methane	2.6	2.7	2.4	2.3	2.4
Total	16.4	16.4	17.0	17.9	18.4
iquid fuels derived from coal and methane at collieries	2.1	1.7	1.9	2.0	1.7
Grand total	267.9	268.5	277.6	288.1	289.9

[1] Conversion factors:
1 ton average salable coal=1 ton coal equivalent.
1 ton oil=1.7 tons coal.
300 therms colliery methane=1 long ton coal or 295 therms=1 metric ton coal.
40,000 cubic feet coke oven gas=1 long ton coal or 1,115 cubic meters=1 metric ton coal.
1 ton coke breeze=0.9 ton coal.
Coal equivalent of hard coke and gas coke is the coal used at coke ovens less coke, coke breeze, and coke oven gas supplied to consumers, to stocks, or for export. Other solid fuels show coal used for production of briquets, etc.

[2] Adjusted for imports or exports.

Source: Ministry of Power Statistical Digest 1963.

MINERAL FUELS

During 1964 the United Kingdom consumption of energy from all sources was equivalent to about 290 million tons of average salable British coal—an increase of 0.6 percent over that of 1963. It is estimated that from 68 to 69 percent of the total energy consumed was derived from domestic resources.

Coal and Coke.—Consumption of coal for all purposes was 6.9 million tons below the 1963 figure while consumption of petroleum fuels increased by 4.7 million tons. These increases in the ratio of liquid to solid fuels occurred mainly in household and other consumer classes using the fuels directly.

TABLE 8.—United Kingdom: Salient statistics of coal, coke, gas, and petroleum

	1960	1961	1962	1963	1964
Deep-mined coal:					
National Coal Board Mines:					
Number in operation	737	698	669	[1] r 611	[2] r 576
Salable output million tons	186.8	182.5	190.8	191.2	188.4
Net value of output million U.S. dollars	1,696.3	1,746.7	1,878.8	1,855.1	NA
Employment:					
Underground thousand persons	482.3	454.3	437.4	[3] 416.0	396.0
Surface at collieries do	122.9	125.2	122.6	116.4	NA
All other do	51.6	52.4	50.5	49.2	NA
Total	656.8	631.9	610.5	581.6	NA
Output per man-shaft:					
At face tons	4.04	4.24	4.62	4.95	5.20
Underground do	1.81	1.88	2.03	2.14	2.23
Total do	1.42	1.47	1.58	[3] 1.67	1.75
Cost per ton at mine U.S. dollars	11.96	12.38	12.20	[3] 12.24	NA
Including labor do	6.59	6.73	6.39	(3)	NA
Average proceeds per ton salable coal do	12.05	12.72	12.85	12.83	NA
Average cash earnings per shift:					
Underground do	9.33	9.86	10.22	[3] 10.82	NA
Surface do	6.32	6.78	7.01	[3] 7.51	NA
Average allowances in kind, all workers do	.53	.56	.62	[3] .65	NA
Licensed mines:					
Number in operation	430	392	360	332	367
Salable output million tons	2.2	2.3	1.6	1.5	1.4
Employment thousand persons•	4.9	4.5	5.1	4.2	4.2
Total operating deep mines	1,167	1,090	1,029	943	943
Total employment thousand persons•	661.7	636.4	615.6	585.8	NA
Salable output	189.0	184.9	192.4	192.4	189.8
Opencast coal:					
Number of producing sites—NCB and licensed	63	49	39	33	46
Total employment thousand persons	5.6	5.3	4.4	4.2	4.2
Salable output million tons	7.7	8.7	8.2	6.2	6.9
Total coal production do	196.7	193.5	200.6	198.9	196.7
Including anthracite do	3.7	3.6	4.0	4.2	4.8
Consumption and shipment of coal:					
United Kingdom:					
Electrical supply industry do	51.9	55.6	61.4	67.9	68.5
Gas supply industry do	22.7	22.6	22.5	22.5	20.5
Coke ovens do	29.0	27.2	23.9	23.9	25.9
Manufactured fuel plants do	1.4	1.5	1.6	1.7	1.4
Railways do	9.0	7.8	6.2	5.0	3.9
Collieries do	5.1	4.6	4.3	4.0	3.8
Iron and steel industry do	3.9	3.2	2.6	2.4	2.1
Engineering and metal trades do	2.9	2.8	2.8	2.7	2.5
Other industry do	25.0	23.6	22.3	21.1	20.4
Domestic do	34.9	32.9	33.2	32.5	28.4
Miscellaneous do	11.1	10.2	10.6	10.6	10.3
Subtotal do	196.9	192.0	191.4	194.3	187.7
Shipments to Northern Ireland and the Channel Islands	2.9	2.8	2.8	2.8	2.5
Total	199.8	194.8	194.2	197.1	190.2
Foreign bunkers million tons	.3	.1	.1	(4)	(4)
Exports do	5.3	5.7	4.8	7.6	.1

See footnotes at end of table.

TABLE 8.—United Kingdom: Salient statistics of coal, coke, gas, and petroleum—Continued

	1960	1961	1962	1963	1964
Consumption and shipment of coal—Continued					
United Kingdom—Continued					
Grand total million tons	205.4	200.6	199.1	204.7	196.3
Stocks at end of year, total do	43.3	37.7	41.0	36.7	38.3
Consumption and shipments of coke:					
Gas works do	1.6	1.4	1.6	1.7	1.3
Blast furnaces do	13.2	12.2	10.8	10.7	12.0
Domestic do	3.5	3.6	4.1	4.4	4.4
Other inland do	9.7	9.3	9.4	8.8	7.4
Total do	28.0	26.5	25.9	25.6	25.1
Exports do	1.1	1.1	1.4	1.7	1.0
Stocks at end of year do	7.8	8.2	6.8	5.5	4.8
Consumption of coke breeze:					
Iron and steelworks million tons	1.6	1.5	1.8	2.0	2.3
Power stations	.9	.9	.9	.7	.7
Gas works	.8	.7	.7	.7	.6
Other	.7	.8	.8	.8	.9
Total	4.0	3.9	4.2	4.2	4.5
Exports of coke breeze	.4	.3	.3	.3	.4
Stocks at yearend	1.3	1.5	1.5	1.6	1.3
Gas supply:					
Production and imports:					
Gas supply industry million therms [5]	[r]2,273	[r]2,229	2,356	[r]2,425	2,324
Coke oven plants do [5]	1,639	1,554	1,353	1,346	1,496
Blast furnaces do [5]	1,720	1,595	1,385	1,339	1,499
Refineries:					
Liquefied petroleum gas million therms [5]	73	96	137	239	346
Other petroleum gas do [5]	960	984	990	1,002	1,127
Natural gas do [5]	28	29	42	56	63
Total	6,693	6,487	6,263	6,407	6,855
Imports [6] do [5]	1	3	4	7	65
Exports [7] do [5]	----------	1	1	11	8
Internal consumption do [5]	2,000	1,922	1,759	1,744	1,945
Losses do [5]	350	344	362	388	418
Consumption:					
Domestic use do [5]	1,324	1,327	1,428	1,566	1,642
Iron and steel do [5]	1,628	1,520	1,313	1,238	1,406
Other industries do [5]	916	907	901	943	985
Other use (public administration, lighting, etc.) million therms [5]	476	469	503	524	516
Total	4,344	4,223	4,145	4,271	4,549
Deliveries of petroleum products for inland consumption:					
Petroleum gases thousand tons	401	481	648	911	1,350
Feedstock:					
For chemical plants do	1,587	1,603	1,980	2,749	3,177
For gas works do	406	505	727	915	1,369
Gasoline:					
Aviation thousand tons	267	272	226	244	196
Wide cut do	733	1,026	820	523	458
Motor do	7,748	8,274	8,702	9,189	10,173
Kerosine:					
Industrial white spirit do	389	365	341	346	379
Jet turbine fuel do	793	892	1,096	1,508	1,686
Other do	1,609	1,516	1,670	1,887	1,642
Gas-diesel oil do	6,220	6,895	7,783	8,899	9,792
Fuel oil do	17,718	19,119	21,671	23,068	25,203
Lubricating oils do	980	996	984	1,019	1,098
Bitumen do	1,079	1,185	1,258	1,336	1,515
Paraffin wax do	55	53	53	54	60
Total products	39,985	43,182	47,959	52,648	58,098
Of which fuels do	(35,895)	(38,980)	(43,343)	(47,144)	(51,869)
Refinery fuel do	3,397	3,571	3,758	3,938	4,083
Grand total	43,382	46,753	51,717	56,586	62,181

NA Not available. • Estimate.

[1] End of March 1963.

[2] End of March 1964.

[3] Fiscal 1963–64.

[4] Less than 50,000 tons.

[5] Therm equals 100,000 British thermal units (B.t.u.).

[6] Natural gas and liquefied petroleum gas.

[7] All liquefied petroleum gas.

Petroleum.—Completion of new refineries at Belfast and Pembroke and expansion at Kent, Grangemouth, Shellhaven, and Stanlow raised British refining capacity to about 71.5 million metric tons annually. Individual refinery capacities were as follows:

Company and refinery	Location	Additions to capacity (thousand metric tons per year)	Total capacity at yearend (thousand metric tons per year)
British Petroleum Co. Ltd.:			
Kent	Isle of Grain	508	10,161
Llandarcy	South Wales		5,588
Grangemouth	Stirlingshire, Scotland	1,270	4,572
Pumpherston	West Lothian, Scotland		183
Belfast	Belfast, Northern Ireland	1,321	1,321
Total		3,099	21,825
Esso Petroleum Co. Ltd.:			
Fawley	Hampshire		11,684
Milford Haven	South Wales		6,554
Total			18,238
The Shell Co. of the United Kingdom, Ltd.:			
Shellhaven	Essex	507	9,652
Stanlow	Cheshire	4,471	10,567
Heysham	Lancashire		1,829
Androssan	Ayrshire, Scotland		183
Total		4,978	22,231
Regent Refining Co. Ltd.: Pembroke	South Wales	4,674	4,674
Mobil Oil Co. Ltd.: Coryton	Essex		2,401
Imperial Chemical Industries Ltd.: North Tees	Durham		1,016
Berry Wiggins & Co. Ltd.:			290
Kingsnorth	Kent		170
Weaste	Manchester, Lancashire		
Total			460
Lobitos Oilfields Ltd.: Ellesmere Port	Cheshire		406
Manchester Oil Refinery, Ltd.: Barton	Manchester, Lancashire		152
Wm. Briggs & Sons Ltd.: Dundee	Angus, Scotland		61
Grand total		12,751	71,464

During the year the United Kingdom area of the North Sea Continental Shelf, covering about 250,000 square kilometers extending from the Straits of Dover to the Shetland Islands and halfway across the North Sea, was delineated by the Minister of Power into blocks of about 250 square kilometers each for licensing purposes. Production licenses will normally run for 6 years with an option on not more than half the original area for 40 years. They will cost £25 ($70) per square kilometer for the initial period and thereafter rise by £25 per square kilometer annually from £40 ($112) to £290 ($180) per square kilometer annually. Royalty will be charged at 12.5 percent of the value of the petroleum at wellhead, but the annual license fees will be deductible from royalty. Royalty will be payable to the Crown without deduction of tax and will be allowable as a deduction from profits for tax purposes.

Exploration licenses convey the right to carry out exploratory work other than deep drilling (beyond 350 meters in depth) in those parts of the designated area not already licensed for production. They will be valid for 3 years and cost $1,000 per annum.

There are new detailed regulations on matters of safety, noninterference with fishing and navigation, the early surrender of licenses, arbitration, and the encouragement of unit development; that is, the cooperative working of contiguous licensed areas. It was foreseen that further sea areas would be designated for exploration after the exact boundaries have been agreed upon with neighboring countries.

At yearend 348 blocks comprising about 87,000 square kilometers had been allocated to 23 companies or groups comprising 51 separate units including most of the free world's leading petroleum producers.

The Mineral Industry of Yugoslavia

By Roman V. Sondermayer[1]

⁂

OUTPUT of minerals and metals in Yugoslavia increased during 1964, and the country maintained its position as a leading producer of nonferrous metals in Europe. The more prominent minerals, with production expressed in approximate percentages of the 1964 world totals are as follows: Mercury, 6.8 percent; antimony, barite, bauxite, lead, and magnesite, 4 to 5 percent; and chromite, copper, feldspar, pyrite, silver, and zinc, 1 to 2 percent. Mineral industry growth was retarded by shortage of electric power and fuel and by low productivity and deficiencies in management processes.

The 1964 mineral and metal output value for the country was about $600 million, roughly 10 percent above that of 1963. The contribution of the mineral industry to gross national product was on the order of 12 percent for 1964. The 255,000 workers represented one-fifth of the total of all industrial employment. International trade of mineral products, both imports and exports, also were of considerable significance to the domestic economy. The value of mineral imports was 17.5 percent of total imports, and mineral exports accounted for 15.4 of the total export value.

Governmental efforts to curb investments in the mineral industry continued, but results were discouraging. Since 1960, the average investments in the mineral industry averaged about 8 percent of total investments in the economy, but in 1964, they represented 10.7 percent of total investments.[2]

The most important mineral developments during 1964 were in the petroleum and ferrous industries. Highlights include discovery of two oilfields—one in Croatia in the western part of Yugoslavia and the second in Backa in the eastern part of the country—and the reconstruction of steel plants in Smederevo in Serbia and Zenica in Bosnia. The steel shortage continued with imports constituting a fourth of requirements. The Government persisted in implementing measures to speed up development of domestic resources for iron and steel production in order to reduce imports and yet to supply domestic demand. Construction of the iron and steel works at Skopje continued. Delays in deliveries of Yugoslav-produced equipment slowed down the construction.

The activities in the nonferrous branch of the industry were limited to improving existing facilities and planning for future expansions. Highlights included beginning of construction of a zinc electrolytic plant in Kosovska Mitrovica as a part of Trepca combine, discovery of additional copper resources near Bor, and commissioning of a new rotary furnace in the Idrija mercury mine.

---

[1] Foreign mineral specialist, Division of International Activities.

[2] Revised figures based on prices for 1960 were used.

PRODUCTION

Development of facilities for production of minerals and metals was in accordance with the general trend of the country's economic development toward modernizing and expanding existing facilities rather than developing new ones. In production of ore, mass methods of production in both underground and opencast mining were used more widely. Mechanization in mining was far from satisfactory, many operations that could be mechanized continued to be manually performed. Productivity for selected mining operations was reported as follows:

	Total mine output, tons per shift				Open-pit output, tons per shift			
	1960	1961	1962	1963	1960	1961	1962	1963
Bituminous coal	0.592	0.600	0.688	0.769	--------	--------	--------	--------
Brown coal	.936	.996	1.033	1.114	3,314	3.086	2.288	3.518
Lignite	1.983	2.180	2.459	2.642	6.014	7.808	5.411	5.485
Iron ore	2.550	2.180	2.600	2.280	2.520	2.120	3.390	2.940
Antimony ore	1.000	1.030	.800	.740	--------	--------	--------	--------
Copper ore	3.160	4.120	5.460	6.700	3.010	10.170	24.060	25.370
Bauxite	1.030	1.450	1.480	1.360	1.310	3.050	3.230	2.430
Lead-zinc ore	1.030	1.080	1.160	1.090	--------	--------	--------	--------
Chromite	.250	.290	.260	.240	--------	--------	--------	--------
Asbestos	.870	.580	.750	.720	1.030	.800	1.170	1.370

Petroleum production although modest by world standards, was by modern and efficient methods. Most of the wells are flowing; pumping was the second-ranked method of oil production. Gas-lift and other production methods remained insignificant, however plans were made for installation of automatic gas-lift and equipment was ordered from the United States and the United Kingdom.

TABLE 1.—Yugoslavia: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Bauxite .... thousand tons	1,025	1,232	1,331	1,285	1,293
Alumina	67,095	71,159	77,064	82,055	87,912
Ingots	25,070	27,407	27,980	35,895	34,763
Rolled products [1]	12,782	11,996	10,537	18,273	19,331
Antimony:					
Ore	109,508	108,013	116,654	123,327	124,965
Concentrate	7,262	7,735	7,064	7,671	7,511
Regulus	2,410	2,463	2,691	2,661	2,729
Arsenic concentrate	1,500	796	913	920	2,025
Bismuth, metal	105	98	91	88	84
Copper:					
Ore .... thousand tons	2,370	3,236	5,070	5,629	5,928
Metal content of ore	33,270	37,909	51,717	62,093	63,184
Concentrate	109,658	148,622	221,471	261,208	287,305
Smelter	35,729	30,869	45,741	[r] 50,779	51,716
Electrolytic	35,053	30,108	45,520	49,032	51,941
Rolled products [2]	33,001	32,625	37,227	44,915	48,519
Chromium:					
Chromite	100,582	108,126	97,045	93,770	88,358
Chromite concentrate	41,641	43,481	44,088	56,176	52,591
Gold .... troy ounces	63,979	67,195	70,506	74,041	93,688
Iron and steel:					
Iron ore .... thousand tons	2,200	2,184	2,190	2,297	2,307
Pig iron .... do	972	997	1,050	996	1,026
Ferroalloys	46,822	55,651	53,469	63,784	50,433
Steel ingots .... thousand tons	1,442	1,532	1,595	1,588	1,677
Rolled products [3] .... do	972	1,009	1,057	1,146	1,204

See footnotes at end of table.

TABLE 1.—Yugoslavia: Production of selected metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals—Continued					
Lead:					
Lead-zinc ore....thousand tons	1,920	2,063	2,239	2,287	2,364
Metal content of ore	91,221	96,681	101,995	[r] 101,578	101,597
Concentrate	117,370	123,502	132,804	135,804	134,398
Smelter	99,738	101,698	113,018	117,481	117,224
Refined	89,143	90,401	97,926	104,174	101,085
Rolled products	6,963	12,817	16,295	18,256	19,445
Manganese ore	13,314	14,148	14,839	8,132	7,784
Mercury:					
Ore	150,900	180,210	192,083	198,089	242,699
Metal....76-pound flasks	14,069	15,954	16,273	[r] 14,406	17,313
Pyrites	417,394	364,313	414,202	356,000	428,000
Selenium....kilograms	NA	849	1,808	1,869	3,828
Silver....thousand troy ounces	3,025	3,454	3,750	3,792	4,036
Tungsten, concentrate	72	7	48	16	121
Zinc:					
Metal content of ore	56,382	59,882	61,114	61,266	66,071
Concentrate	97,003	113,899	118,889	126,960	132,711
Smelter	19,748	20,401	20,232	22,009	25,290
Electrolytic	16,187	16,467	19,072	20,222	19,222
Rolled products	5,255	5,957	6,948	10,063	12,233
Nonmetals:					
Asbestos:					
Ore	234,460	270,291	253,774	253,407	264,780
Fiber	5,416	6,086	6,714	8,232	8,419
Barite, crude	109,489	104,210	103,763	104,486	[e] 101,670
Cement:					
Portland....thousand tons	2,363	2,307	2,445	[r] 2,825	3,018
Other....do	35	29	74	[r] 22	21
Gypsum:					
Raw	124,363	97,005	118,046	138,046	139,413
Calcined	26,934	32,113	30,553	39,330	44,314
Lime:					
Burned....thousand tons	697	725	768	860	906
Hydrated	6,879	25,051	48,110	90,044	129,229
Feldspar, raw	14,001	20,539	[r] 32,085	[r] 29,885	30,550
Mica....kilograms	2,354	[r] 1,686	[r] 2,433	[r] 35,300	11,660
Mineral fertilizers:					
Phosphatic	248,000	413,000	520,000	731,000	967,588
Others	175,000	250,000	400,000	347,000	421,300
Refractories:					
Fire clay:					
Raw	132,777	152,264	144,707	210,346	232,354
Burned	30,070	34,282	33,937	39,393	43,520
Magnesite:					
Raw	251,847	273,065	373,362	411,959	497,420
Calcined	21,805	25,591	24,019	26,466	32,068
Sintered	90,891	97,885	131,626	155,016	177,933
Other [4]	174,156	171,538	193,509	215,645	254,129
Salt:					
Sea	35,687	45,193	86,522	[r] 32,618	52,748
Brine	115,745	115,754	128,331	[r] 133,934	131,230
Other nonmetals	250,536	301,668	355,032	512,725	677,592
Mineral fuels:					
Coal:					
Bituminous....thousand tons	1,283	1,313	1,188	1,286	1,310
Brown....do	9,628	9,494	9,319	9,945	10,715
Lignite....do	11,801	13,266	14,186	16,191	17,534
Briquets	8,963	4,732	3,244	[r] 15,899	3,963
Coke:					
Metallurgical....thousand tons	1,013	1,028	1,030	1,108	1,177
Breeze....do	70	71	77	81	70
Gaswork....do	20	17	18	16	17
Manufactured gas..million cubic feet	[r] 1,422	[r] 1,339	[r] 1,600	[r] 1,964	2,144
Natural gas....do	1,976	2,566	3,557	[r] 7,131	10,224
Petroleum:					
Crude....thousand tons	944	1,341	1,526	1,611	1,799
Refinery products:					
Gasoline....do	277	293	321	344	385
Kerosine....do	70	58	80	89	98
Diesel fuel....do	353	404	532	618	701
Lubricants....do	61	72	99	112	126
Heating oil....do	396	409	492	480	683
Carbon black	3,862	4,398	3,735	[r] 4,281	4,907
Bitumen	71,875	80,030	113,834	119,816	150,850

NA Not available. [r] Revised.

[e] Estimate.

[1] Including aluminum alloys.

[2] Including copper alloys.

[3] Including pipes.

[4] Includes shamotte, magnesite, chrome-magnesite, other refinery material, and silica bricks.

TRADE

Minerals continued to occupy an important position in overall trade, both export and import. During 1963, mineral exports valued at $48.4 million accounted for 15.4 percent of total export value and mineral imports valued at $65.4 million constituted 17.5 percent of total import values. Although corresponding figures are not available for 1964, the trend was clearly upward for both mineral export and import volumes, but the trend was downward for the overall share of minerals and mineral products in the country's total exports.

Nonferrous metals contributed significantly to Yugoslavia's mineral exports, accounting for $26.9 million or roughly 55 percent of the value of all mineral exports in 1963, a 6-percent increase over those of 1962.

The import of iron and steel industry products totaled $37.3 million or half of the total import of minerals. Ferrous products registered a 14-percent increase over those of 1962.

The export pattern remained the same as in past years—increasing exports of finished products and imports of raw material.

TABLE 2.—Yugoslavia: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Bauxite	913,957	997,261	West Germany 702,913; Italy 228,561; East Germany 50,587.
Alumina	14,182	13,268	Austria 5,867; Poland 7,400.
Aluminum unwrought	----------	14	West Germany 14.
Semimanufactured products	12,655	14,187	U.S.S.R. 5,942; United States 1,988; Czechoslovakia 1,708; India 1,030.
Antimony regulus	2,280	2,360	United States 2,114; West Germany 189; Canada 21.
Chromite concentrate	30,144	23,513	Sweden 23,513.
Copper:			
Scrap and filling	11	11	Italy 11.
Alloys unwrought	856	863	Italy 538; West Germany 305.
Semimanufactured products	15,447	17,804	U.S.S.R. 6,077; Indonesia 2,468; United States 2,114.
Iron and steel:			
Iron ore	101,943	153,978	Hungary 153,961; East Germany 17.
Scrap	2,832	692	Italy 613; West Germany 65; Austria 12.
Ferroalloys	26,435	36,808	Federal Republic of Germany 12,759; Sweden 7,867; Austria 5,430; United Kingdom 4,264; Italy 2,374; United States 2,205.
Cast iron	60	----------	
Steel ingots and billets	51,317	27,836	Italy 27,745; Austria 91.
Rolled products	164,698	119,351	Italy 37,087; East Germany 29,999; U.S.S.R. 22,374; Greece 11,066; Bulgaria 10,954.
Other semimanufactured products.	68,526	69,250	East Germany 21,857; Italy 12,703; West Germany 5,455; Egypt 5,328; Czechoslovakia 4,923; Austria 4,636.
Lead:			
Refined	52,073	52,596	United States 26,831; U.S.S.R. 10,724; Poland 3,254; Czechoslovakia 2,914; Austria 2,758.
Alloys	877	841	Austria 474; Italy 266; West Germany 100.
Cable lead	6,421	3,812	Austria 2,047; West Germany 1,764.
Semimanufactured products	8,233	7,774	Italy 5,957; Indonesia 442; Egypt 409; West Germany 368.
Mercury ..... 76-pound flasks	9,512	10,556	United States 4,495; U.S.S.R. 2,610; Israel 998.
Pyrites concentrate	293,988	281,085	Italy 70,610; Czechoslovakia 49,512; Egypt 67,872; West Germany 53,807; Poland 23,700; Switzerland 14,527.

TABLE 2.—Yugoslavia: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals—Continued			
Zinc:			
Concentrate	30,037	25,057	Poland 11,814; France 7,460; West Germany 3,856; Austria 1,926.
Electrolytic	7,146	5,741	Italy 1,931; West Germany 1,040; Czechoslovakia 1,000; United States 975.
Semimanufactured products	6,900	8,812	West Germany 3,434; Denmark 1,246; France 1,577; United States 986.
Nonmetals:			
Asbestos, fiber	5,380	5,362	United States 5,242; Poland 74; Austria 45.
Barites	87,959	76,146	United States 27,556; U.S.S.R. 25,097; Poland 3,781; Hungary 14,499.
Bentonite	8,707	13,052	Poland 7,384; Italy 4,116; Sweden 700; Egypt 400.
Cement:			
Portland	300,557	183,306	Liberia 31,415; Kuwait 29,350; Malta 27,443; Ghana 27,462; Nigeria 14,250; Switzerland 8,250.
Other	36,039	81,774	Sudan 27,800; Italy 17,940; Switzerland 17,190.
Feldspar	18,746	16,598	East Germany 6,430; Poland 5,345; Austria 2,157; Italy 1,449.
Fire clay:			
Raw	7,844	4,913	Hungary 4,913.
Calcined	----------	2,475	Italy 2,413; Austria 62.
Lime:			
Calcined	717	2,676	Italy 2,676.
Hydrated	10	147	United States 127; Guinea 19.
Magnesite:			
Raw	493	3,839	East Germany 3,839.
Calcined	16,950	21,858	Netherlands 8,565; Poland 6,420; West Germany 3,569; Rumania 2,034.
Sintered	45,827	63,779	United States 20,502; Poland 19,958; West Germany 7,407; Hungry 4,986; Italy 9,241.
Mineral fuels:			
Coal:			
Bituminous	1,280	9,714	Italy 6,296; Greece 3,040; Austria 377.
Dust	83,097	74,845	Italy 71,930; Austria 2,515; Greece 400.
Brown	14,417	39,968	Austria 38,178; Italy 1,770; Greece 20.
Dust	575	40	Italy 40.
Lignite	11,872	25,502	Austria 230; Italy 25,271.
Petroleum:			
Crude	560,722	455,090	Austria 363,980; Israel 91,110.
Refinery products:			
Gasoline	25,664	10,591	Austria 9,901; United States 203; Switzerland 120.
Diesel fuel	154,365	3,967	Hungary 1,518; United Kingdom 531; Israel 417.
Jet fuel	NA	1,560	Czechoslovakia 353; U.S.S.R. 495; Egypt 208.
Heating oil	76,939	66,323	West Germany 45,903; Austria 11,247; United Kingdom 3,073.
Lubricants	25,329	46,752	Egypt 4,630; India 42,096; Switzerland 20.
Other products	192	250	Austria 194; Greece 55.

NA Not available.

TABLE 3.—Yugoslavia: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources 1963
Metals:			
Aluminum:			
Bauxite	2,724	3,077	British Guiana 3,077.
Unwrought	10,717	6,734	U.S.S.R. 6,474; United States 196; France 40.
Semimanufactured products	588	1,052	Austria 419; West Germany 231; Italy 237;
Chromite	36,864	58,969	Albania 33,966; Turkey 22,894; U.S.S.R. 2,108.
Cobalt unwrought	36	43	Belgium-Luxembourg 43.
Copper:			
Blister	148	----------	
Electrolytic	7,111	6,005	West Germany 2,304; Belgium-Luxembourg 1,499; Rhodesia 1,101.
Scrap and fillings	4,948	4,504	United States 4,233; Canada 202; United Kingdom 69.
Semimanufactured products	559	603	West Germany 240; East Germany 105; Italy 93.
Iron and steel:			
Iron ore	353,143	431,567	India 356,672; Brazil 20,726; Morocco 47,920; Algeria 5,588; France 600; West Germany 60.
Scrap	79,730	48,797	Algeria 39,718; Lebanon 6,100; Kuwait 2,160; West Germany 818.
Cast iron	114,398	80,315	U.S.S.R. 45,192; Hungary 21,332; East Germany 11,196; Canada 999.
Ferroalloys	1,047	1,484	U.S.S.R. 339; France 269; Sweden 215; Federal Republic of Germany 137; Switzerland 135.
Ingots and billets	3,382	20,628	Rumania 20,374; Austria 221; Poland 31.
Rolled products	327,086	378,848	Italy 68,182; Poland 61,403; U.S.S.R. 46,517; France 39,745; Czechoslovakia 34,669; Hungary 26,233; Japan 25,158; West Germany 23, 274.
Other semimanufactured products.	52,586	68,752	Czechoslovakia 15,375; Italy 13,995; Poland 8,248; Hungary 6,280; West Germany 6,035; Austria 5,543; Belgium-Luxembourg 3,869; East Germany 2,658; United Kingdom 2,112.
Lead, refined	749	3,048	Netherlands 1,438; Italy 1,107.
Manganese:			
Ore	44,934	36,034	India 20,924; Morocco 8,000; U.S.S.R. 1,864.
Unwrought	41	18	Japan 10; Belgium-Luxembourg 6; United Kingdom 2.
Nickel:			
Unwrought	362	575	United Kingdom 475; U.S.S.R. 100.
Semimanufactured products	16	83	West Germany 55; Austria 15; Italy 3.
Tin:			
Unwrought long tons	896	2,150	Indonesia 1,450; Malaya 500; United Kingdom 200.
Scrap do	6	----------	
Semimanufactured products. do	22	25	West Germany 20; United Kingdom 3; Italy 2.
Zinc:			
Electrolytic	499	717	Netherlands 512; West Germany 200; Italy 5.
Semimanufactured products	6	76	West Germany 67; Italy 6; United Kingdom 1.
Nonmetals:			
Asbestos	9,328	8,103	U.S.S.R. 4,735; United States 1,290; Republic of South Africa 1,039.
Cement:			
Portland	13,702	19,459	U.S.S.R. 19,459.
Others	3	2,477	Bulgaria 2,215; Italy 112.
Chalk	180	135	United Kingdom 69; Netherlands 23; East Germany 20.
Cryolite, natural	761	30	East Germany 30.
Fertilizers:			
Natural phosphates raw	324,275	540,593	Jordan 157,691; Egypt 236,616; Tunisia 120,902.
Potash, raw	14,488	403	U.S.S.R. 337; East Germany 66.
Fire clay:			
Raw	9,028	6,895	Czechoslovakia 5,116; Poland 1,724.
Burned	28,746	27,372	Czechoslovakia 14,179; Poland 10,680; Federal Republic of Germany 2,470.
Fluorite, natural	3,275	2,497	East Germany 1,310; Bulgaria 901; West Germany 240.
Fluorspar, raw	198	577	East Germany 577.

TABLE 3.—Yugoslavia: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources 1963
Nonmetals—Continued			
Gypsum, raw	12	----------	
Graphite:			
Raw	1,227	1,120	Austria 731; West Germany 217; Czechoslovakia 128.
Retort	114	41	East Germany 22; Italy 18.
Kaolin	17,216	20,814	Greece 4,825; Czechoslovakia 11,233; East Germany 3,345.
Magnesite, calcined	20	30	Austria 30.
Mica, in strips	6	22	India 22.
Refractory brick:			
Shamotte	687	4,602	Norway 2,092; Poland 901; U.S.S.R. 713; Hungary 546.
Dinas	775	2,559	U.S.S.R. 2,543; Italy 16.
Silica	341	208	Belgium-Luxembourg 123; West Germany 69; Italy 16.
Magnesite	10	2,047	Norway 1,947; Austria 100.
Chrome-magnesite	36	41	Italy 41.
Salt	28,168	1,290	Rumania 1,270; West Germany 20.
Sulfur	10,106	12,672	France 6,681; Italy 4,010; U.S.S.R. 1,770; Bulgaria 190.
Talc, natural	353	680	Italy 317; India 200; Austria 52; U.S.S.R. 49; Czechoslovakia 61.
Mineral fuels:			
Anthracite	122,370	120,461	U.S.S.R. 117,173; Morocco 3,288.
Coal:			
Bituminous:			
Coking	1,222,000	1,318,326	U.S.S.R. 936,243; United States 382,083.
Gas	24,516	22,000	Czechoslovakia 14,035; Poland 7,964.
Forge	21	20	West Germany 20.
Coke:			
Metallurgical	243,983	229,068	Poland 71,788; Czechoslovakia 71,580; United Kingdom 26,968; Italy 22,660.
Dust	3,065	810	Czechoslovakia 790; Poland 19.
Petroleum coke	13,878	15,500	United States 15,500.
Petroleum:			
Crude	746,864	778,060	Iraq 348,330; U.S.S.R. 233,762; Algeria 73,876; Venezuela 54,524; Egypt 39,797.
Refinery products:			
Gasoline	16,829	10,635	U.S.S.R. 10,238; Rumania 395; United Kingdom 1.
Diesel oil	233,113	97,142	Rumania 45,168; U.S.S.R. 38,249; Czechoslovakia 13,725.
Heating oil	19,168	42,441	U.S.S.R. 24,129; Rumania 18,311.
Lubricants	8,223	11,142	Rumania 1,328; U.S.S.R. 1,171; Hungary, 797; West Germany 137; Italy 258; United States 1,221; Poland 3,068.
Other products	17,161	16,625	United States 9,052; Italy 2,791; U.S.S.R. 88.

COMMODITY REVIEW

METALS

Aluminum.—Bauxite exploration near Obrovac in Dalmatia continued and the results of detailed prospecting confirmed the extent of the mineralization and indicated a reserve of 38 million tons. The deposits had been revealed by preliminary exploration in 1963.

Authorities of Bosnia and Hercegovina started to analyze the possibility of constructing an integrated aluminum plant in Mostar. The plant would be based on 14 million tons of bauxite in nearby deposits. According to the proposal, the first stage of construction would include facilities for production of 200,000 tons of alumina and 20,000 tons of aluminum per year. The second stage of construction would increase capacity of the aluminum section to 60,000 tons per annum.

The surplus alumina will be exported. Water and electric power would be provided by the Neretva hydroelectric power system which includes the Jablanica and the Rama hydroelectric power plants. The new aluminum plant in Mostar, if constructed, will employ 1,000 workers.

Copper.—The discovery of three significant copper deposits near Bor was announced. The favorable location, close to the existing Bor operation, makes this discovery significant. Existing haulage and beneficiation facilities at Bor may be used for the transportation and processing of ore from these deposits; thus investment required to bring these ore bodies into production will be low. The fact that experienced mining personnel were already residing in the area also was advantageous.

Preparations for the start of the second phase of modernization and expansion of the existing mine and smelter at Bor were nearing completion at yearend. By the end of 1971 the expansion of beneficiation plants at Bor and Majdanpek and of the smelter and electrolytic plant at Bor will be completed, raising combined capacity of the Bor-Majdanpek complex to 95,000 tons of refined copper annually.

Gold and Tungsten.—The marginal gold-tungsten mine at Blagojev Kamen near Kucevo in Serbia was closed in the spring because of unprofitable production. A token labor force remained to aid the Belgrade Geological Bureau in exploration for additional ore.

Iron and Steel.—Efforts to alleviate shortage of products dominated activities in the iron and steel industry throughout 1964. Further exploration of the area around Ljubija iron ore mine confirmed the preliminary results announced in 1963 and set the reserve of the area at 160 million tons. Average iron content was estimated at 50 to 55 percent. The investment for development of the deposits will total $24 million. Reportedly, when this mine is fully developed, output of Bosnia and Macedonia will be adequate to support production of 6 million tons of steel annually for 20 years; of this total, the Ljubija mine is to supply over 80 percent.

The reconstruction of plants in Smederevo and Zenica, anticipated to be completed during 1969, lagged behind plans. Difficulties were encountered in providing credits for the reconstruction, delaying the start of the work. When the reconstruction is completed, the Zenica Iron and Steel Works will produce 2.5 million tons of pig iron, 2.2 million tons of steel, and 1.25 million tons of coke, doubling existing capacity with an employment increase of only 1,500, from 13,500 to 15,000 workers. The Smederevo plant, when completely reconstructed, will produce about 300,000 tons of steel. Plant design and equipment were provided by the U.S.S.R.

A new rolling mill with a capacity of 265,000 tons of rolled products a year was commissioned in the iron and steel works at Sisak, Croatia, in the fall of 1964. Over $16 million was invested in this fully automated installation that was partially financed from a $8.5 million credit supplied by the U.S. Agency for International Development. The necessary equipment was supplied by U.S. firms.

In the Niksic iron and steel works, delivery of electrical equipment behind schedule slowed down modernization.

Two 40-ton electric arc-melting furnaces, made in the United Kingdom by A.E.I. Birlec, Ltd., were received by the Ravne steel plant in Slovenia. They will be used for the production of plain carbon steel. A third furnace from the same producer was delivered in the Store Steelworks in Slovenia.

The construction of an iron and steel complex in Skpoje was delayed because of slow delivery and assembly of steel structural parts and other Yugoslav-made equipment. The schedules for beginning production were not changed because time lost would probably be made up during 1965.

Lead and Zinc.—The construction of the new zinc electrolytic refinery of the Trepca Mine in Kosovska Mitrovica started in May 1964. When completed in 1968, the plant will produce 30,000 tons of electrolytic zinc, 4,000 tons of zinc alloys, 85 tons of cadmium and 67,000 tons of sulfuric acid annually; it will employ only 265 workers.

At the Zletovo lead-zinc mine in southeastern Macedonia, 1.5 billion dinars was allocated for improvements and expansion of mines and benefication installations. The 7-year plan calls for production of 1 million tons of ore annually when the expansion is completed. Financial arrangements for construction of a new smelter at Zletovo had not been made, pending a decision by Government officials as to the relative merits of erecting these new works or of expanding the Trepca facilities. If built as planned, the new Zletovo smelter would have an annual capacity of 35,000 tons of zinc and 30,000 tons of lead.

Manganese.—The shortage of good quality manganese ore continued, but metallurgists developed a method for concentrating low-manganese content domestic ore. The process for obtaining manganese concentrate from deposits near Trepca (about 1.8 million tons with a manganese content of 12.6 percent) represents a solid basis for future reduction of manganese ore imports.

Mercury.—Yugoslavia remained a significant mercury producer, contributing about 6.8 percent of the world total. During 1964, a new deposit of rich mercury ore was discovered in the vicinity of the Idrija mercury mine in Slovenia. Reserves were not determined, but preliminary estimates indicate that they will permit production at present levels until the end of this century.

At the same mine, after completion of the second rotary furnace in 1964, plans were made to put a third one into operation. Smelting capacity will be increased 40 percent when the expansion is completed.

NONMETALS

The production of nonmetals was larger than in 1963. Main activities were concentrated in the areas of cement, salt, and fertilizer production. Existing facilities range from backward and antiquated to advanced and modern. Most modern developments are fertilizer plants and cement factories.

Cement.—Cement production in 1963 and 1964, while sufficient to meet priority construction needs was inadequate to satisfy the total demand, requiring modest imports. The shortage was a result of increased construction. To reduce imports and to increase cement output, a program of expansion of existing cement factories was initiated. According to reports, four cement factories were to be expanded and modernized, one each at Usje in Istria, Dalmacija-Cement near Split, Novi Popovac in Serbia, and Beocin in Vojvodina. When completed in 1967, total annual capacity of these factories will be increased by 1.1 to 1.2 million tons.

The construction of the Zenica cement plant, located between Zenica and Kakanj progressed according to plans. Its completion will add 300,000 tons of cement capacity annually to the Yugoslav total.

Fertilizers.—Domestic production failed to meet fertilizer demand, and large quantities of all kinds of fertilizers had to be imported.

The superphosphate factory in Kosovska Mitrovica, put in production in November 1963, had a successful year; output reached the planned level of 345,000 tons of superphosphate, 129,000 tons of sulfuric acid, and 2,310 tons of artificial cryolite. The basic raw materials were pyrrhotite from the Trepca lead-zinc mine and imported phosphate rock.

Plans for construction of a new nitrogenous fertilizer plant with an annual capacity of 800,000 tons were completed. The plant will be either in Kutine or Sisak in Croatia.

Pyrite.—Most of the pyrite was produced in copper mines of Bor and Majdanpek and the production of pyrite concentrate declined in 1964. A major part of the production was exported. The domestic market was hampered by the larger use of smelter gases for production of sulfuric acid.

Salt.—Imports of large quantities of salt indicated that domestic output was inadequate to cover demand. Exploration conducted in the Tuzla area of Bosnia resulted in the discovery of salt deposits near Shiboshnica. The extent of the deposit was not determined and further exploration was underway.

At the only operating rock salt mine in Yugoslavia at Tusanj near Tuzla, sudden flooding filled the main shaft and caused the death of one miner. Polish experts assisted in rescue operations.

The large salina on the Adriatic coast in Ulcinj was expanded, and hundreds of acres were added to its evaporating facilities.

MINERAL FUELS

Coal remained the backbone of Yugoslav energy production, although natural gas was emerging as a significant competitor. Because of large reserves of low-grade coals, efforts were concentrated on building facilities for conversion of this low-grade coal to energy forms that can be delivered more economically to consumers. At the same time, larger production of natural gas and crude oil created railroad transportation and general distribution problems. Preliminary plans were made for a pipeline system connecting principal producing areas with consumers.

Coal.—Output of coal was larger than in 1963, but difficulties in supply persisted. A shortage of coal was felt through the year and the private citizen felt it most. The major problem of the coal industry was the labor shortage resulting from low wages. Inability of mines to pay workers a wage commensurate with the nature of their work was largely a result of the artifically low price of coal imposed by the Government. The disparity between coal prices and prices of other materials resulted in low profitability of coal mines, and internal accumulation of capital for modernization was therefore reduced to almost nothing. The need to increase both coal production and the income of miners has been recognized for years but necessary funds have not been made available.

The most important events in the coal industry were the beginning of construction of a coal gasification plant at Velenje in Slovenia, the commissioning of a drying plant in the Kosovo-Metohija basin, and the discovery of new lignite deposits in Serbia.

The British firm, Humphreys and Glasgow, Ltd., will supply the gas purification plant for Velenje which will handle 96 million cubic feet of crude gas a day. Long-term credit totaling $15.4 million has been extended to the buyer of the project. The gas will be transported by a 240-kilometer pipeline to all industrial centers in northern Slovenia. The plant is scheduled for completion by yearend 1965.

A significant achievement in upgrading coal was the commissioning of the drying plant in the Kosovo-Metohija basin in Obilic. Annual capacity of the new plant was 610,000 tons of dry coal. The Fleiser system produces fuel rated at 4,000 calories per kilogram from lignite. The bulk of the equipment was imported from Austria, the Federal Republic of Germany, and France. The dry coal will be used for coke production in the new steel plant near Skopje in Macedonia.

Among the several lignite deposits discovered in 1964, the one near Cacak, Western Serbia, was the most important. According to reports, it contains a reserve of 20 million tons. A new shaft was sunk in the Jelasnica mine near Nis in Eastern Serbia, as part of a program to increase mine capacity from 83,000 tons to 115,000 tons annually.

Coke production remained inadequate to cover the needs of the domestic steel industry, but commissioning of the third coke battery in Lukavac near Tuzla was a significant event that will cut down coke imports in the future. The new battery, with an annual capacity of 200,000 tons of coke, was built with Soviet technical assistance and equipment.

Petroleum and Gas.—The petroleum industry of Yugoslavia again had a year of successful development. Discoveries of new fields, reconstruction and expansion of old refineries, construction of a new refinery, and mergers of oil industry enterprises set a solid base for further development.

Following discovery of gas in Backa in northeast Yugoslavia in 1963, oil was found 5 kilometers southwest from Srbobran in early 1964. Depth of the producing zone was about 1,000 meters. In the Sava River Valley, between Zagreb and Sisak near the Zutica forest, a new oilfield was discovered, with a 60-meter-thick pay zone at a depth ranging from 1,700 to 2,000 meters. The swampy terrain will create difficulties in development of the field, but exploitation can be expected toward the end of 1966.

Modernization and expansion of oil refineries included commissioning of a catalytic reformer in the refinery at Sisak, Croatia. The new installation has a daily output capacity of 200 tons of 93-octane gasoline. Preliminary reconstruction work on the Bosanski Brod refinery in Bosnia started in midsummer 1964, but a fire damaged the refinery and slowed down reconstruction. When modernization is completed, capacity will be 1.1 million tons of crude oil annually.

The construction of the Pancevo refinery, scheduled for completion early in 1968, progressed according to plans.

Production of natural gas was higher than in any previous year, but capacity output was not attained because the existing gas pipeline network was inadequate. Conversion of industry and households in the vicinity of the oil and gasfields to gas fuel was underway, including development of a basic pipeline network.

The Government approved the merger of Naftaplin, the Croatian enterprise for production and drilling, with refineries at Rijeka and Sisak in Croatia. The new organization operated under the name of Ina and had headquarters in Zagreb.

The Naftagas enterprise for drilling and production for oil in Serbia was merged with the refinery under construstion at Pancevo and the nitrogenous fertilizer plant in Pancevo.

Electric Power.—The shortage of electric power continued, and financial losses of the industry were severe. The shortage, which amounted to around 1.5 billion kilowatt-hours, or roughly one-tenth of total needs in 1964, was expected to persist through 1965 and even through 1966. Reportedly, the shortage was primarily a consequence of delays in powerplant construction. Powerplants lagging behind schedules include hydroelectric plants at Trebisnjica (1 year), Senj (12 to 24 months), and Globocica (20 months), and thermal plants at Kosovo and Belgrade (1 year).

Regional Mineral Industry Review of Africa

By Thomas C. Denton [1] and William C. Henkes [2]

⁂

ALL of the 48 political divisions of Africa were accessible to non-Communist world industry and commerce throughout 1964, although in some of them revolt and political attitudes presented problems. The position of the continent as a whole for mineral and mineral fuel resources, production, and oversea exports continued to improve. At yearend, significant quantities [3] of a greater number of mineral commodities vital to industry and agriculture were being produced than in any other continent. This statement excludes Communist areas on other continents but might well hold true even if such areas were included.

Deriving from its exceptionally diversified production, Africa furnished overseas industrialized countries as a whole a greater variety of key mineral commodities than any other area. In addition, the value of mineral imports from Africa into the United Kingdom and continental non-Communist Europe probably exceeded the value of such imports from any other area if gold is included and mineral fuels excluded.

The only mineral commodities vital or particularly important to industry and agriculture that in 1964 were not produced in significant quantity were mercury, molybdenum, nickel, potash, and titanium. At yearend, no large firm reserves of mercury or molybdenum had been established. With respect to nickel, the present small output of the continent will be substantially increased if a decision is reached to exploit a significant Rhodesian copper-nickel sulfide deposit that through 1964 had not been worked. In addition, a sizeable reserve of silicate nickel existed in the Republic of Malagasy (Madagascar).

Regarding potash and titanium, at yearend, large production of these minerals in the near future was virtually assured. The existence of large reserves of potash had been established in Ethiopia and in Republic of Congo (Brazzaville), and in Sierra Leone it was planned to produce around 100,000 tons of rutile annually from large developed deposits. Such output would be around 50 percent of non-Communist world rutile production in 1964.

---

[1] Africa specialist, Division of International Activities.
[2] Petroleum engineer, Division of International Activities.
[3] As used in this chapter, significant production means production in quantities representing at least 3 percent of world production exclusive of Communist countries.

PRODUCTION

METALS

For many years a major feature of the African mining industry has been its very large production of gold and more recently of platinum and other metals of that group. The Republic of South Africa has accounted for the great bulk of African output of these precious metals. Almost entirely due to a further increase in South Africa, gold production in Africa in 1964 reached the record high of 30.9 million ounces. This was 77 percent of world output exclusive of Communist countries. The contribution compares with 75.7 percent in 1963 and 64.8 percent for the average annual share of Africa during the 5-year period, 1955–59.

With respect to platinum, South Africa has only one producer, and that output is not published. It is estimated that 1964 output was around 600,000 ounces. Such production would put the African share of non-Communist production at nearly 55 percent in 1964. Canada was the other important non-Communist producer but ranked well below Africa if the estimate for South Africa is reasonably accurate. Cobalt and germanium are two other metals for which Africa has been the principal source for many years, its output generally being 80 percent or more of total non-Communist world output.

The African share of 1964 non-Communist world production of 13 additional key metals ranged from 3 to 55 percent. Major contributions were columbium and tantalum concentrates (55 percent), chromite and manganese ore (each 52 percent), beryl (41), antimony (40), vanadium (32), copper (24), and uranium (17). Zambia, formerly Northern Rhodesia, ranked second after the United States for copper production in 1964.

Assuming in West Africa political stability and a favorable investment climate, Africa can be expected to produce ultimately much larger quantities of bauxite, alumina, and aluminum. The following was the situation in 1964. Ghana, Guinea, and Sierra Leone produced appreciable tonnages of bauxite for export. A smelter in Cameroon using hydrogenerated electricity turned out 50,600 tons of primary aluminum. In Ghana a smelter was under construction that will use electricity generated at a dam on the Volta River and will have annual aluminum capacity of about 90,000 tons. The Cameroon smelter gets its alumina from Guinea, which produced nearly 500,000 tons in 1964, and at the outset the Ghana smelter also will import its alumina, despite the fact that Ghana has important bauxite reserves. Bauxite for the single alumina plant in Guinea presently comes from a deposit situated at the plant. Besides this situation, Compagnie des Bauxites de Guinée (CBG), a joint venture of Harvey Aluminum, Inc., and the Republic of Guinea, was preparing to mine and dry a large tonnage of bauxite in the Boke bauxite area of Guinea, partly for export to a 240,000-ton alumina plant Harvey was building in the Virgin Islands, and partly for sale to other bauxite consumers. At yearend CBG was actively seeking to negotiate long-term contracts for such sales of Boke bauxite.[4]

With the assumptions stated earlier, that further expansion of the West African primary aluminum industry will occur seems certain in view of the area's large bauxite reserves and hydroelectric power potential and its proximity to major world aluminum markets. At Boke alone there is at least a billion tons of top quality bauxite, and major virgin water powers exist on the Konkouré River in Guinea, the Kouilou River in Republic of Congo (Brazzaville), and the Congo River in the Republic of the Congo (Léopoldville). The Congo River power is the world's largest undeveloped water power.

At yearend there were only three countries in all Africa that possessed an integrated iron and steel industry, namely the Republic of South Africa, Southern Rhodesia, and the United Arab Republic (Egypt); and that the United Arab Republic (Egypt) industry could be considered integrated was somewhat doubtful in as much as it depended on imports for coke. In 1964 the South African industry, thoroughly modernized, produced over 3 million tons of steel ingots and castings, compared with about 250,000 tons for United Arab Republic (Egypt) and 50,000 tons for Rhodesia. At yearend the South African industry was being expanded in an effort to satisfy sharply rising domestic iron and steel demand and with a view to increasing export sales.

In several other countries there were, of course, facilities for producing small quantities of iron and steel and simple rolled products based on scrap as the raw material. By yearend complaints were heard about the inadequacy of such facilities and there was talk about the feasibility of establishing additional primary steel industry, particularly in West Africa, where large iron ore tonnages were being mined for export.

NONMETALS

Africa has regularly accounted for about 99 percent of non-Communist diamond production and by value diamond is its most important nonmetal product. Ten separate political divisions of the continent were producers in 1964. Diamond sales in 1964 by De Beers Consolidated Mines, Ltd., the company that markets about 80 percent of world production, amounted to $373 million, $48 million more than in 1963 and a new record high.

Other important nonmetal output included crude phosphates produced in seven divisions, and asbestos, nearly limited to South Africa and Southern Rhodesia. The continent's share in non-Communist world production of these minerals in 1964 was respectively 36 percent and 19 percent. The varieties of asbestos that South Africa produces are mostly crocidolite and amosite. South Africa is the only source of amosite, a highly strategic material for the United States, and is the world's major source of crocidolite.

---

[4] American Metal Market. V. 71, No. 224, Nov. 19, 1964, p. 16.

Table 1.—Major African contributions to world mineral production

(Metric tons unless otherwise specified)

Commodity	Average, 1955–59			1963			1964 [p]		
	Quantity	Percent of—		Quantity	Percent of—		Quantity	Percent of—	
		Non-Communist world [1] production	World production		Non-Communist world [1] production	World production		Non-Cummunist world [1] production	World production
Metals:									
Aluminum:									
Bauxite	557,635	3.4	2.6	1,903,120	8.2	6.2	2,106,465	8.1	6.3
Alumina	NA		NA	480,035	NA	NA	484,350	NA	NA
Antimony concentrate, antimony content	13,586	47.2	26.6	11,993	39.8	21.5	14,485	40.2	23.4
Beryl	3,722	39.7	38.8	2,485	43.6	37.1	[2] 1,743	41.5	33.5
Chromite	1,139,828	39.5	28.3	[3] 1,197,259	53.2	30.3	1,325,891	53.0	31.0
Cobalt, content of metal	10,316	73.7	73.7	9,453	80.8	80.8	10,762	83.6	83.6
Columbium and tantalum, concentrate ......kilograms	2,543,184	76.3	NA	2,479,521	48.7	NA	2,752,138	54.6	NA
Copper:									
Ore and concentrate, content of metal	769,567	26.2	22.3	983,265	25.8	20.8	1,082,902	27.2	22.0
Smelter production	720,954	23.3	20.0	953,640	23.7	19.2	1,036,740	24.3	19.9
Germanium	NA	(4)	(4)	NA	(4)	(4)	NA	(4)	(4)
Gold ......thousand troy ounces	18,907	64.8	57.3	29,370	75.7	66.4	30,930	77.0	67.1
Iron and steel:									
Iron ore ......thousand tons	12,320	4.2	3.0	20,671	6.2	4.0	29,444	7.9	5.1
Pig iron [5] ......do	1,601	1.1	.8	2,691	1.4	1.0	3,146	1.5	1.0
Lead:									
Concentrate, content of metal	228,341	13.1	9.8	190,057	10.7	7.5	149,760	8.8	6.0
Metal	68,811	4.1	3.1	52,981	2.9	2.1	91,256	5.0	3.6
Lithium minerals	NA		NA	46,832	95.1	NA	62,735	NA	NA
Manganese ore ......thousand tons	2,331	40.4	19.1	3,160	49.1	21.6	3,656	52.8	24.2
Platinum-group metals [6] ......troy ounces	435,188	52.1	39.7	305,687	41.0	19.8	606,185	57.7	29.6
Silver ......thousand troy ounces	11,150	5.8	4.9	6,570	3.1	2.6	6,760	3.2	2.7
Tin:									
Concentrate, content of metal ......long tons	23,183	15.8	12.7	19,888	14.1	10.4	21,303	14.4	11.0
Metal ......do	4,050	2.8	2.2	11,939	8.3	6.2	11,727	8.2	6.2
Titanium:									
Ilmenite	78,979	4.9	NA	44,541	2.2	NA	4,949	.2	NA
Rutile	2,679	2.6	NA	1,968	1.0	NA	NA		NA
Tungsten concentrate (60 percent WO_3 basis)	2,257	6.4	3.6	443	2.1	.7	748	3.2	1.3

Uranium oxide	6,940	18.6	NA	4,111	14.6	NA	4,032	17.4	NA
Vanadium, concentrate and pentoxide, content of metal	635	15.3	NA	2,291	35.3	NA	2,218	32.1	NA
Zinc:									
Concentrate, zinc content	234,806	9.7	7.6	249,453	9.1	6.8	271,417	8.8	6.8
Metal	76,553	3.4	2.7	102,175	4.0	2.9	102,265	3.7	2.8
Nonmetals:									
Asbestos	277,575	20.5	14.8	348,703	19.8	11.9	373,270	19.1	11.6
Barite	71,994	2.9	2.6	109,806	4.6	3.8	105,218	4.2	3.4
Corundum	4,493	92.6	49.9	5,462	89.2	54.6	2,659	80.2	33.2
Diamond:									
Gem — thousand carats	NA	----------	----------	6,079	95.7	92.2	6,035	95.3	91.9
Industrial — do	NA	----------	----------	27,061	99.1	90.0	26,673	99.0	89.8
Mica	3,819	3.3	2.5	3,886	2.8	2.2	4,489	3.1	2.4
Phosphate rock — thousand tons	9,658	34.6	28.4	14,038	36.5	27.4	15,689	36.1	26.8
Mineral fuels:									
Coal — thousand tons	43,281	3.7	1.6	46,594	3.7	1.8	49,441	3.8	1.8
Petroleum:									
Crude — thousand 42-gallon barrels	[7] 104,125	1.6	1.4	432,682	5.5	4.5	621,576	7.3	6.0

---

[e] Estimate. [p] Preliminary. NA Not available.

[1] Excludes Albania, Bulgaria, China (mainland), Cuba, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Rumania, U.S.S.R., North Viet-Nam, and Yugoslavia.

[2] Exports only for Uganda.

[3] Sudan production estimated.

[4] Africa is by far the world's largest primary producer.

[5] Includes ferroalloys.

[6] Content of primary platinum raw materials.

[7] Data for 1960.

MINERAL FUELS

The 1964 coal production of the continent, nearly limited to the Republic of South Africa and Rhodesia, amounted to 49 million tons, nearly 4 percent of non-Communist production.

More significant was the situation with respect to petroleum. Important quantities of crude oil were produced in Libya and Algeria and smaller quantities in the United Arab Republic (Egypt), Nigeria, Republic of Gabon, Angola, Morocco, and Republic of Congo (Brazzaville), in that order for size of 1964 production. Total crude production for the year was 621.6 million barrels. This was 7.3 percent of non-Communist crude petroleum production in 1964, which compares with 5.5 percent for the share of Africa in 1963 and 1.6 percent in 1960. At yearend the outlook was for substantial further expansion of the African industry in Libya and Nigeria. Important reserves have been established in those countries and in Algeria.

It was notable that the petroleum production of the continent was confined to countries fronting the Mediterranean and the Atlantic. For countries fronting the Indian Ocean, the outlook for discovery perhaps appeared best in Mozambique. Substantial search was going on in the Republic of South Africa where at yearend oil had not been found.

The great bulk of Africa's crude petroleum production has been exported to oversea countries, particularly to West Europe, and by value petroleum refinery products now comprise a very large part of Africa's mineral and energy imports. But African refining capacity is growing and the need for product imports can be expected to decline sharply. At yearend there were 20 refineries on the continent, with 7 more under construction or planned. Annual crude petroleum capacity of existing facilities was around 183 million barrels. The United Arab Republic (Egypt) and the Republic of South Africa each had three refineries and accounted for about 27 percent and 21 percent, respectively, of total capacity.

CONTRIBUTION TO MINERAL SUPPLIES OF SELECTED COUNTRIES

Several mineral commodities exported from Africa in important quantity reach the consuming country in part via third countries outside the continent. This situation as well as the fact that for some countries available trade reports do not provide complete mineral commodity detail, make it difficult to determine the true contribution of Africa to the mineral imports of a given country. This applies particularly to raw diamond and to a lesser extent to cobalt, primary platinum raw materials, and primary germanium raw materials. Complete 1964 data are not available; information presented here is for 1963.

Table 2.—Selected African contributions to mineral imports of major industrial areas in 1963

(Metric tons unless otherwise specified)

Commodity	United States[1]			European Ecomonic Community[2]			United Kingdom[2]			Japan[2]		
	Total imports	From Africa		Total imports	From Africa		Total imports	From Africa		Total imports	From Africa	
	Quantity	Quantity	Percent of total	Quantity	Quantity	Percent of total	Quantity	Quantity	Percent of total	Quantity	Quantity	Percent of total
Metals:												
Aluminum:												
Bauxite	9,317,000			1,857,365	53,443	2.9	337,000	206,000	61,1	1,421,423		
Alumina	NA	NA		184,460	155,126	84.1	NA	NA		50,538		
Metal, semimanufactures and scrap	422,945	2,640	0.6	248,349	45,821	18.4	NA	NA		NA		
Antimony concentrate	8,876	3,602	40.6	NA	NA		12,188			6,196	1,021	16.5
Beryl	5,663	2,802	49.48	NA	NA		NA	NA				
Chromite	1,261,999	822,069	65.14	374,415	95,463	25.5	162,594	69,451	42.7	226,516	50,031	22.1
Cobalt:												
Oxide	212	NA		NA	9,600		386	[3] 399	100.0	NA	NA	
Metal	4,682	2,198	46.94							NA	NA	
Columbium and tantalum concentrate	2,681	713	26.6	[4] 558,411	[4] 23,295	4.2	821	NA		77	56	72.7
Copper:												
Ore and concentrate	44,124	4,487	10.17	162,549	13,897	8.6				600,150	9,120	1.5
Blister and refined	442,912	56,864	12.84	952,317	458,316	48.1	500,770	229,153	45.8	56,209	29,593	52.6
Scrap	2,652	17	.6	34,886	10,055	28.8				82,850	2,320	2.8
Germanium:												
Concentrate and semirefined kilograms	2,243			NA	[5] 9,000		NA	NA		NA	NA	
Gold, bullion troy ounces	1,280,619	691	.1	NA	NA		[6] 34,298,567	34,298,567	100.0	NA	NA	
Iron and steel:												
Iron ore thousand tons	33,797	1,354	4.07	36,544,040	8,171,477	22.4	14,551	2,535	17.4	26,267,928	823,741	3.1
Pig iron do	585	70	11.88	1,171,617	83,616	7.1				1,542,848	251,600	16.3
Ferroalloys:												
Ferromanganese	104,668	14,715	14.1	77,169	21,098	27,3	55	36	65.5			
Other	NA	NA		181,713	10,914	6.0	159	16	10.1	[7] 2,114	1,723	81.5
Lead:												
Concentrate	134,029	30,869	23.02	385,304	169,513	44.0				68,649		
Metal	NA	NA		185,071	32,561	17.6				24,021		
Lithium minerals	20,378	20,378	100.0	NA	NA		3,250	NA		NA	NA	
Manganese ore	2,167,737	854,737	39.43	1,837,810	1,370,329	74.6	316,000	121,000	38.3	367,730	104,631	28.5
Platinum-group metals:												
Matte troy ounces	58,338	900	1.5	NA	NA		NA	NA	(8)	NA	NA	
Semirefined do	701,213	675	.1	578,713						221,840		
Silver, unwrought thousand troy ounces	59,062	493	.8	2,323	9	.4	21,517	1,802	8.4	114,305		

Table 2.—Selected African contributions to mineral imports of major industrial areas in 1963—Continued

(Metric tons unless otherwise specified)

Commodity	United States[1]			European Ecomonic Community[2]			United Kingdom[2]			Japan[2]		
	Total imports	From Africa		Total imports	From Africa		Total imports	From Africa		Total imports	From Africa	
	Quantity	Quantity	Percent of total	Quantity	Quantity	Percent of total	Quantity	Quantity	Percent of total	Quantity	Quantity	Percent of total
Metals—Continued												
Tin:												
Concentrate.....long tons..	2,140	-----	-----	24,455	9,632	39.4	16,205	556	3.4	1,614	-----	-----
Metal.....do....	43,601	2,194	5.03	24,688	1,738	7.0	7,927	5,609	70.6	14,587	-----	-----
Zinc:												
Concentrate.....	338,170	7,814	2.31	843,316	225,587	26.8	107,428	-----	-----	147,506	-----	-----
Metal.....	131,321	10,498	7.99	131,988	21,448	16.2	162,757	7,266	4.5	8,404	1,294	15.4
Nonmetals:												
Asbestos.....	505,872	37,296	6.15	312,473	71,294	22.8	160,082	82,662	51.6	115,492	29,826	25.8
Barite.....	524,442	46,978	8.96	NA	NA	-----	28,482	NA	-----	11,343	-----	-----
Diamond:												
Gem.....thousand U.S. dollars..	129,870	[9]29,294	22.6	220,964	21,119	9.6	NA	NA	-----	NA	NA	-----
Industrial.....do....	[10]49,871	[10]27,615	55.4	43,148	13,499	31.3	NA	NA	-----	9,025,786	723,072	8.0
Phosphate:												
Crude.....	163,287	39,153	24.0	7,015,964	5,432,732	77.4	1,436,000	889,000	61.9	2,063,110	360,622	17.5
Superphosphate.....	66,791	NA	-----	134,000	73,764	55.0	26,000	-----	-----	NA	NA	-----
Mineral fuels:												
Coal.....	156,239	-----	-----	32,428,561	570,153	1.8	66,218	-----	-----	11,142,621	104,002	.93
Petroleum:												
Crude.....thousand 42-gallon barrels..	412,660	9,173	2.2	[11]1,201,272	286,247	23.8	405,886	19,438	4.8	51,894,961	13	-----
Refinery products.....do....	364,922	-----	-----	[11]142,864	5,639	3.9	134,436	-----	-----	11,490,112	376	-----

NA Not available.

[1] Quantity figures for concentrates represent content of metal except in the case of columbium-tantalum and germanium which are gross weight.

[2] Quantity figures for concentrates represent gross weight.

[3] Exports to United Kingdom reported by Zambia.

[4] Includes ores and concentrates of titanium, vanadium, molybdenum, tantalum, and zirconium.

[5] Exports to European Economic Community reported by Republic of the Congo (Léopoldville).

[6] Unrefined and refined, gold content.

[7] All ferrochromium.

[8] Africa supplies the major part of primary platinum raw materials imported.

[9] If imports from the United Kingdom and Western Europe are included, the import figures and percentages are: For gem, $123.3 million, 95.0 percent; and for industrial uses, $47.6 million, 95.5 percent.

[10] Includes diamond dust and powder.

[11] EEC data in metric tons were converted to U.S. barrels at the rate of 1 metric ton=7.4 42-gallon barrels.

Source: For United States: Minerals Yearbook, 1963, v. 1; for European Economic Community: Statistical Office of the European Communities, Foreign Trade Analytical tables, Imports, 1963; for United Kingdom; Board of Trade, Accounts Relating to Trade and Navigation of the United Kingdom December 1963; for Japan: Ministry of Finance, Trade of Japan, 1963.

UNITED STATES

Besides total imports of $123 million worth of raw gem diamond, the United States imported in 1963 from Africa, the United Kingdom, and Western Europe 9.1 million carats of industrial diamond valued at $41 million, of which 6.2 million carats valued at $24 million came directly from Africa. Other vital minerals and metals for which the United States was wholly or largely dependent on foreign sources and which were imported from Africa in 1963 included the following, with the African share of the total United States imports given in percent: Amosite asbestos, 100; lithium minerals, 100; chromite, 65; beryl, 49; cobalt, 47; antimony concentrates, 41; manganese ore, 39; columbium-tantalum concentrates, 27; and tin, 5. Further contributions by Africa to United States imports in 1963 included: Uranium (U_3O_8), 27; lead concentrates, 23; ferromanganese, 14; blister and refined copper, 13; pig iron, 12; barite, 9; zinc metal, 8; and iron ore, 4.

COUNTRIES OF THE EUROPEAN ECONOMIC COMMUNITY

The countries of the European Economic Community (EEC) are Belgium, France, the Federal Republic of Germany, Italy, Luxembourg, and the Netherlands. Examination of EEC mineral and mineral fuel imports in 1963 and the part of those imports that originated in Africa bears out the statement attributed to President Salzazar of Portugal some years ago that Europe could not survive longer that a few months if its mineral supplies from Africa were cut off.

Metals.—In 1963 the EEC obtained from Africa more than 15 metals in ores and concentrates and as metal in quantities representing from 3 to 84 percent of total imports of the metals. Among ores and concentrates were alumina, 84 percent of total alumina imports; manganese ore, 74 percent; lead concentrate, 44 percent; tin concentrate, 39 precent; zinc concentrate, 27 percent; chromite, 25 percent; and iron ore, 22 percent. In the area of metals and ferroalloys the major contributions from Africa were blister and refined copper, 48 percent; ferromanganese, 27 percent; aluminum, 18 percent; lead, 17 percent; zinc, 16 percent; pig iron, 7 percent; and tin, 7 percent. In addition, it may be assumed that at least 80 percent of EEC imports of primary refined cobalt and of semirefined germanium (not reported separately) originated in Africa.

Nonmetals.—In 1963, as for many years past, the continent furnished most of the EEC supply of raw phosphates besides a large part of the EEC's modest imports of superphosphate. Imports of raw rock in 1963 totaled 7 million tons, of which more than three-quarters came from the continent, and more than one-half of superphosphate imported, originated there.

Mineral Fuels.—Africa is rapidly becoming a very important supplier of crude petroleum to the EEC and ultimately it may become an important source of refinery products. The African contribution to EEC crude oil imports in 1963, 162.3 million barrels, was nearly 24 percent; for product imports of 19.3 million barrels, the share was nearly 4 percent. With respect to coal, nearly 2 percent of total imports of 32.4 million tons came from South Africa and Rhodesia where the heating value of export coal is substantially lower than that of the coal the United States exports to Europe in large tonnages.

UNITED KINGDOM

The United Kingdom continued to occupy a preferred position among importers of African minerals and metals in several respects. It has received virtually all of the refined and doré gold bullion that the continent has produced and virtually all of the continent's platinum, which the United Kingdom receives from South Africa for refining, separation of the various metals of the platinum group, and sale of the metals. Imports of African gold bullion in 1963 in terms of gold content totaled 34,298,567 ounces, or $1.2 billion. Imports of South African primary platinum raw materials were not available. In refined form, the value of the metals of the platinum group contained in 1964 imports may well have been $40 million or more. Finally, the major part of gem diamond mined in Africa goes into London for sale.

In addition, the United Kingdom for many years has been heavily dependent on Africa for a great number of vital mineral commodities. Principally such imports from Africa in 1963 for which statistics were available, and in percent, the African share of the total import of the commodity were as follows: Bauxite, 61; chromite, 43; refined and blister copper, 46; iron ore, 17; ferromanganese, 65; other ferroalloys, 10; manganese ore, 38; tin metal, 71; and zinc metal, 4. For nonmetals and mineral fuels from Africa, major imports were asbestos, 52; raw phosphates, 62; and crude petroleum, 5. In addition, imports of liquefied natural gas from Algeria commenced in 1964; plans were to import about 700,000 tons annually (equivalent to 100 million cubic feet per day), which would supply 10 percent of the United Kingdom's entire gas consumption. At yearend, studies were being made of the feasibility of obtaining additional supplies of liquefied natural gas from Nigeria.

JAPAN

Trade between Africa and Japan has grown in recent years, and the exports of the continent to Japan have been largely mineral commodities. In 1964 the principal exporting countries were South Africa, Rhodesia, Zambia, Swaziland, Morocco, and Senegal. In 1963 the major African contribution to Japanese mineral imports and in percent, the African share of the total imports were as follows: Ferromanganese, 81 percent; columbium-tantalum concentrates, 73 percent; blister and refined copper, 52.6; manganese ore, 28; asbestos, 26; chromite, 22; crude phosphate, 17; antimony concentrates, 16; pig iron, 16; zinc metal, 15; and iron ore, 3 percent. At the end of 1964 the tonnage of iron ore going to Japan from Africa was expected to increase.

IMPORTS INTO AFRICA

In 1964 petroleum products probably still comprised both in volume and value by far the largest import into the continent with respect to its imports of metals, minerals, semimanufactures of mineral origin, and mineral fuels. The petroluem product import in 1962 was about 12 million tons. Product imports could be expected to decline sharply because, as shown earlier, African refining capacity was increasing nearly throughout the continent. This, of course, will result in substantial savings in foreign exchange, which at yearend was in embarrassingly short supply in several countries of Africa, particularly Guinea, Ghana, and Republic of the Congo (Léopoldville).

By volume, cement was the second largest mineral import in 1962 when the continent took about 2.2 million tons. Cement probably also ranked second in 1964. This import also could be expected to decline because African manufacturing capacity was expanding.

In 1962 imports of iron and steel semimanufactures and manufactured fertilizers ranked third and fourth. The volume of these imports was respectively about 1.6 million tons and 854,000 tons. At yearend it appeared that the semimanufactures would have to be imported in substantial tonnages for some time; fertilizer manufacturing capacity was being increased to some extent.

The Mineral Industry of Algeria

By William C. Henkes[1]

⁂

ALGERIA'S mineral industry continued in 1964 to suffer from lack of capital, organization, and technical experience; deficiencies which, together with mass unemployment, have burdened the general economy of the country during the state of transition that has persisted since the country attained independence in 1962.

Petroleum continued to be the dominant mineral product and the major export. The 1964 production of crude oil and condensate was valued at about $470 million.[2] Lead and zinc, copper, and iron ore were other important minerals. Output of phosphate rock, which has historically been a major product, declined sharply because of the practical exhaustion of the one operating mine; a new mine now under development will probably not be in production before 1966. The exploration and production sectors of the mineral industry, including petroleum, provide direct employment for more than 15,700 persons.

In terms of worldwide mineral resources, only the petroleum and natural gas in Algeria were of major importance. The daily average crude oil and condensate production of 560,000 barrels placed the country ninth among free world oil producing countries. Its estimated reserves of 7.5 billion barrels amount to 2.2 percent of world's estimated reserves.[3] Proximity to the huge energy market of Europe made oil Algeria's most important natural resource.

GOVERNMENT POLICIES AND PROGRAMS[4]

The Government announced a policy of nationalization of industry. Government spokesmen have repeatedly emphasized that foreign oil companies operating in the country are entitled only to their operating expenses and a just return on their investments. The Government intends to have controlling interest in all phases of the industry—production, refining, distribution, and marketing of petroleum.

Recognizing the need for capital investments and technological experience, the Government has been willing to hold its socialist goals in abeyance while encouraging private investments. Some of the factors that discouraged the entry of private capital were restrictions on repatriating profits, limitation of profits, government participation in ownership, and participation by worker councils in management functions.

---

[1] Petroleum engineer, Division of International Activities.
[2] 1 Algerian dinar (DA) = US$0.2026; US$1.00 = 4.937 DA.
[3] Oil and Gas Journal. V. 62, No. 52, Dec. 28, 1964, pp. 106–107.
[4] U.S. Embassy, Algiers, Airgram A–205, Nov. 25, 1964. pp. 2, 3.

PRODUCTION

The general downward trend in mineral production since about 1960 may have reached a low in 1963 and the upward movement in 1964 may presage future improvement or stabilization. In some cases, notably iron ore, iron pyrite, and natural gas, the 1964 improvement was exceptional; the sharp decline in phosphate rock production because of exhaustion of ore reserves at the one operating mine should be reversed when the new mine at Djebel Onk is opened.

TABLE 1.—Algeria: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1960	1961	1962	1963	1964
Metals:					
Antimony, content of concentrate	712	653	[r] 643	---	---
Copper, content of concentrate	138	609	779	1,036	1,092
Iron ore ... thousand tons	3,438	2,867	2,062	1,976	2,739
Lead, content of concentrate	10,459	9,200	9,040	8,260	9,548
Silver [2] ... troy ounces	300,000	300,000	300,000	250,000	NA
Zinc, content of concentrate	40,134	42,600	41,700	34,476	38,227
Nonmetals:					
Barite	55,850	26,969	[r] 25,985	[r] 29,136	27,844
Cement ... thousand tons	1,062	1,072	650	884	730
Diatomite	22,014	31,130	27,728	[r] 17,648	20,402
Fuller's earth	102,000	116,426	38,437	[r] 81,608	49,240
Gypsum	176,563	[e] 175,000	[e] 175,000	[e] 175,000	NA
Lime	85,600	60,200	[e] 31,200	[e] 15,600	[e] 27,720
Phosphate rock	563,047	425,652	389,866	[r] 348,141	72,877
Pyrite	38,500	48,857	43,000	[r] 37,750	60,957
Salt ... thousand tons	[e] 143	131	[e] 131	130	NA
Mineral fuels:					
Coal ... do	119	78	53	[e] 40	[e] 40
Coke (low temperature) ... do	93	[e] 85	[e] 70	[e] 65	NA
Fuel briquets ... do	45	40	[e] 27	[e] 25	NA
Natural gas, marketed ... million cubic meters	NA	231	353	394	809
Natural gas liquids	31,857	[r] 135,813	201,869	[r] 240,687	257,763
Petroleum:					
Crude ... thousand tons	[r] 8,637	15,664	[r] 20,498	[r] 23,655	26,226
Refinery products: [3]					
Gasoline	---	---	---	---	325,878
Kerosine	---	---	---	---	141,504
Distillate fuel	---	---	---	---	447,775
Residual fuel	---	---	---	---	278,785
Liquefied petroleum gas (LPG)	---	---	---	---	38,159
Total	---	---	---	---	1,232,101

[e] Estimate. [r] Revised. NA Not available.

[1] In addition Algeria produces various construction materials, but data are fragmentary and unreliable.

[2] Estimated recoverable silver content of lead and zinc concentrates.

[3] Production of the Algiers refinery (Société de la Raffinerie d'Alger), which commenced operations about Mar. 1, 1964; does not include output of field topping plants which is used for fuel.

TRADE

The Algerian Government does not publish complete export and import statistics. The data presented in this chapter are believed to account for over 90 percent of Algeria's foreign trade.

Exports of petroleum gave Algeria a much improved trade balance. Preliminary data show that 1964 trade with France was slightly in favor of Algeria: Exports to France were valued at $570.5 million (of which $306.3 million were from crude petroleum), whereas imports from France amounted to $554.5 million.[5]

---

[5] Sous-Direction des Statistiques Algiers. Bulletin Mensuel de Statistique Générale, No. 1, 1965, 42 pp.

These data also show that trade with the United Kingdom for the first 9 months of 1964 gave Algeria a favorable balance: Exports of $17.7 million (of which $8.7 million represented iron ore) and imports of $9.2 million.

United States exports to Algeria during the first 10 months of 1964 reached $45.9 million, an increase of nearly 37 percent over the same period of 1963.

TABLE 2.—Algeria: Major exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:[1]			
Aluminum	1,544	2,088	Italy 1,250; France 693.
Copper	9,714	9,741	France 4,036; West Germany 3,289.
Iron and steel:			
Iron ore and concentrate thousand tons	[2] 2,004	[2] 1,651	United Kingdom 830; Italy 650; West Germany 112.
Scrap	57,980	49,878	Italy 49,688; France 171.
Semimanufactures	3,617	2,402	France 1,652; Italy 750.
Lead:			
Ore and concentrate	3,821	1,160	All to France.
Unwrought and scrap	3,063	3,577	France 2,169; Italy 1,378.
Zinc:			
Ore and concentrate	78,298	68,006	France 67,769.
Scrap	502	687	France 367; Italy 320.
Ore, nonferrous, unspecified	775	----------	
Scrap and cinder, unspecified	145	124	France 110.
Nonmetals:			
Barite	----------	732	Italy 707.
Bentonite and other clays	39,044	41,020	France 35,933; Italy 4,130.
Cement	----------	4,791	Italy 2,795; France 1,996.
Cement, semimanufactures	----------	2,140	All to France.
Diatomite	9,262	7,257	France 5,062; Belgium-Luxembourg 1,812.
Fertilizers, phosphatic, including phosphate rock.	[3] 379,343	[e] 229,529	Spain 106,500[e]; France 95,391; Italy 22,595.
Pyrites, unroasted	28,725	32,000	France 29,720.
Salt, common	41,740	35,721	All to Belgium-Luxembourg.
Tile, clay	----------	110	All to France.
Mineral fuels:			
Coal	1,710	----------	
Petroleum:[4]			
Crude thousand tons	20,371	23,655	France 15,215; West Germany 2,604.
Refinery products: Bunkers, unspecified thousand tons	264	342	

[e] Estimate. No 1963 data for Spain, estimated on basis previous year.

[1] Includes unwrought metal, semimanufactures, and scrap, unless otherwise specified.

[2] Includes figures from: United Kingdom Board of Trade. Accounts relating to Trade and Navigation of the United Kingdom, December 1963, 468 pp.

[3] Includes figures from: Ministerio de Hacienda, Madrid. Estadística del Comercio Exterior de España, Tome 1, 1962, 1035 pp.

[4] From U.S. Bureau of Mines.

Source, unless otherwise specified: Statistical Office of the European Communities, Brussels. Foreign Trade Statistics, Analytical Tables, Imports and Exports, 1962, 1963.

TABLE 3.—Algeria: Major imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:[1]			
Aluminum	735	877	France 771; West Germany 106.
Copper	673	670	France 660.
Iron and steel:			
Iron oxide	[2] 96	76	West Germany 49; France 27.
Pig iron and ferroalloys	374	269	All from France.
Bloom, billet, and casting	3,892	213	All from France.
Rails and track material	11,443	1,912	France 1,888.
Pipe, tube, and fittings	62,655	67,119	France 66,941.
Other rolled products	70,941	71,603	France 66,413; West Germany 4,083.
Lead:			
Ore and concentrate	300	----------	
Unwrought and semimanufactures	292	491	France 489.
Precious metals ... troy ounces	6,440	6,430	All from France.
Tin ... long tons	22	34	All from France.
Zinc	490	575	France 499; Belgium-Luxembourg 59.
Other metals	77	182	France 164.
Nonmetals:			
Abrasives	6,441	----------	
Asbestos	908	819	All from France.
Barite	7,856	2,653	All from France.
Cement	114,316	24,580	France 22,330.
Dolomite and chalk	5,472	4,737	All from France.
Fertilizers:			
Nitrogenous	19,084	43,346	All from France.
Phosphatic	595	317	All from France.
Potassic	1,289	11,892	France 8,862; Belgium-Luxembourg 2,530.
Others	7,356	2,891	All from France.
Gypsum	4,894	2,155	All from France.
Lime	5,221	5,503	All from France.
Sand	2,984	5,952	Netherlands 3,925; Belgium-Luxembourg 1,875.
Sulfur:			
Crude	13,194	27,689	All from France.
Refined	----------	882	All from France.
Construction material[3]	30,448	16,179	France 14,699; Italy 770.
Others, unspecified[4]	3,057	4,364	France 4,205; Italy 113.
Mineral fuels:			
Coal	43,841	11,960	West Germany 8,720; France 3,241.
Other solid fuels	881	2,946	West Germany 2,891.
Byproducts of coal	1,944	1,954	All from France.
Petroleum, refinery products:[5]			
Gasoline ... thousand tons	307	323	NA.
Kerosine ... do	89	125	NA.
Distillate fuel oil ... do	306	348	NA.
Residual fuel oil ... do	117	120	NA.
Lubricants ... do	36	[e] 35	NA.

[e] Estimate. NA Not available.

[1] Includes unwrought metal, semimanufactures, and scrap, unless otherwise specified.

[2] Includes 51 tons from Spain; reported in Estadística del Comercio Exterior de España, 1962, Tome I, Ministerio de Hacienda, Madrid.

[3] Includes building stone, marble, crushed rock, brick, and tile.

[4] Includes clay, salt, mineral pigment, talc, carbon black, and radioactive chemicals.

[5] Includes all imports; Source: Comité Professionel du Pétrole, Activité de l'Industrie Pétrolière, 1964, Tome I, p. E-35.

Source, unless otherwise specified: Statistical Office of the European Communities, Brussels. Foreign Trade Statistics, Analytical Tables, Imports and Exports, 1962, 1963.

COMMODITY REVIEW

METALS

Iron Ore.—Iron ore production, which has declined steadily since 1960, apparently reached its low mark in 1963; 1964 production was up about 39 percent, mainly as a result of increased output at the Ouenza-Bou Khadra mines. These mines produced 1,957,000 tons in 1964 compared with 1,458,000 tons in 1963. Production from the Beni Saf mines, supervised by Bulgarian specialists, declined from 182,000 tons in 1963 to 175,000 tons in 1964; however, this production was nearly

10 percent greater than the 1962 figure. The iron ore industry employed an average of 3,975 persons in 1964.

The 1964 exports went primarily to the traditional customers: United Kingdom (1,078,574 tons), Italy (856,201 tons), and West Germany (286,914 tons). In addition, U.S.S.R. imported 241,360 tons, and Bulgaria imported about 174,000 tons. For the first time since 1956, the United States imported Algerian iron ore (20,330 tons).

Iron and Steel.—Based on second trimester figures, output of steel plate and unwrought iron and steel by the Algerian metal-working industry in 1964 was about 47,000 tons.

Lead and Zinc.—The most significant development in this area was the sharp drop in exports of lead ore to Morocco, formerly the best customer for Algeria's output; exports declined from 7,735 tons in 1963 to 2,431 tons in 1964. Employment in lead and zinc mines at the end of 1964 was 1,440 persons compared with 1,199 the previous year.

NONMETALS

Barite.—Although barite production decreased slightly from that of 1963, domestic consumption dropped from 26,292 tons in 1963 to 20,586 tons in 1964; this resulted from the decreased activity in the petroleum industry where barite is used in well drilling mud.

Iron Pyrites.—The only iron pyrite mine, Aïn Ben Merouane (sometimes called El Halia) was nationalized in November 1963, and a Government advance of $110,000 was made to modernize the mine. The increased demand for pyrites at local fertilizer plants has reduced availability for export; this demand rose from 8,644 tons in 1962 to 23,257 tons in 1964.

Phosphate Rock.—The extreme drop in phosphate rock production reflected the virtual exhaustion of the Kouif mine, which was the only phosphate producer in the country. It was planned to maintain production at this mine only at a level to supply domestic needs until a new mine at Djebel Onk, 100 kilometers south of Tebessa, becomes productive. During 1964, the railway from Tebessa and some of the buildings at the mine site were completed, but it is thought that the mine will not be in commercial production before mid-1966.

MINERAL FUELS

Coal.—The sole coal mine at Kenadsa furnishes fuel for a thermal electric generating plant at Colomb-Béchar; studies were being made to convert this plant to diesel fuel, in which event the coal mine will shut down.

Petroleum and Natural Gas.—Under the threat of nationalization, the petroleum industry did not show the growth rate characteristic of previous years. The Algerian and French Governments continued negotiations over revisions of the Evian agreement of 1962. The Algerian Government seeks a greater share in both the profits and the operations of the oil companies.

The uncertainty and insecurity of the petroleum sector of the economy were shown by the decline in drilling of 35 percent in 1964, to a total of 831,000 feet. Drilling activity in December was 18 rig-months compared with 38.8 rig-months for December 1963, and 1964 seismic activity was 61 percent less for the same period.[6] Production of crude oil increased only 11 percent over that of 1963. Marketing of natural gas more than doubled in 1964—809 million cubic meters (30.2 billion cubic feet)—because of completion of the Arzew gas-liquefaction plant.

Three events of 1964 were of special significance to the Algerian petroleum industry: (1) Commencement of construction of a new crude oil pipeline from Hassi Messaoud to the port of Arzew; (2) completion of the gas-liquefaction plant at Arzew; and (3) completion of the 2.5 million ton-per-year refinery at Algiers.

The crude oil pipeline has been urgently needed to permit movement of additional oil from Saharan fields where an estimated 150,000 barrels per day of production is currently shut-in.[7] On April 5, 1964, the Algerian Government-owned company, Société Nationale de Transport et de Commercialization des Hydrocarbures (SONATRACH), contracted with a British firm, Constructors John Brown, for the building of the 800-kilometer, 28-inch line from Haoud el Hamra (Hassi Messaoud terminal) to Arzew. The estimated cost of $70 million will be provided by British banks ($30.8 million), the Kuwait Government ($19.6 million), and the Interarab Development Bank ($14–19 million); construction time was to be 15 months. Initial capacity was to be 10 million tons per year, and ultimate capacity 22 million tons per year. The line will parallel the existing 8-inch pipeline carrying distillate from Hassi R'Mel to Hassi Messaoud and the 24-inch gasline from Hassi R'Mel to Arzew.

The Arzew gas-liquefaction plant was officially inaugurated on September 27, 1964, bringing to fruition more than 2 years of construction and planning. The $86.8 million plant is owned by Compagnie Algérienne du Methane Liquide (CAMEL) which, in turn, is owned 20 percent by the Algerian Government and 80 percent by United States, British, and French companies. The plant's daily capacity of 150 million cubic feet of gas is fully committed to British and French interests: 100 million cubic feet to the United Kingdom and the rest to France. Natural gas from Hassi R'Mel field is purified, liquefied at –258° F, and shipped by special tankers to Europe. Two 12,200-ton-capacity tankers are used for shipments to the United Kingdom, and one 9,760-ton-capacity tanker is used for shipments to France. The estimated landed cost of this gas in the Thames River estuary (United Kingdom) is 7.25 cents per therm (100,000 British thermal units).[8]

The refinery of Société de la Raffinerie d'Alger at El Harrach (Maison Carrée), 12 kilometers east of Algiers began production in March 1964. The refinery, built at cost of about $41 million,[9] is mainly owned by Compagnie Française des Pétroles (CFP), 20 percent; Société Shell d'Algérie, 18 percent; Esso Mediterranean, Inc., 17.6 percent; Compagnie Française de Raffinage, 12 percent; Société Française des Pétroles BP, 10.4 percent; and Société Nationale de Recherche et d'Exploitation des Pétroles en Algérie (SN REPAL), 10 percent. The plant was designed to process high-gravity, low-sulfur crude oil from the Hassi Messaoud field and condensate from the Hassi R'Mel gasfield. The crude oil and condensate is shipped by tanker from the Bougie pipeline terminal to Algiers, then by pipeline to the refinery site. The refinery output in 1964 (table 1) was mainly in the form of distillate fuel (about 36 percent) and gasoline (about 26 percent).[10]

---

[6] Direction des Carburants, Ministère de l'Industrie, Paris. Activité de l'Industrie Pétrolière. Bull. Decembre 1964, p. 2.

[7] Lichtblau, J. H. North Africa Set To Give Middle East Tough Competition. Oil and Gas International, v. 4, No. 9, September 1964, pp. 55–59.

[8] The Institute of Petroleum Review. Algerian Natural Gas for Britain, v. 18, No. 214, October 1964, pp. 378–389.

[9] Petroleum Times. V. 68, No. 1741, May 1, 1964, p. 213.

A pilot gas-injection project in the Hassi Messaoud field was of considerable potential significance. This experimental secondary recovery project was expected to lead to full-scale repressuring of the Cambrian reservoir. It was hoped that this repressuring would increase the recovery factor in the field from its present 10 percent to at least 25 percent and possibly to 60 percent. A secondary objective was to furnish the pipeline with crude oil stabilized at 44.9° API (American Petroleum Institute). Initial plans called for injecting about 100 million cubic feet of gas per day at 5,000 to 6,000 pounds per square inch in two wells in the northern part of the field and about 140 million cubic feet per day at the same pressure into five wells in the southern part.[11]

SOURCE MATERIALS

Since Algeria's independence, statistical data are fragmentary and unreliable; most of the foreign trade data are derived from published data of nations trading with Algeria. For these reasons, most of the statistics in this chapter are partial and subject to more or less revision.

Because of the fragmentary nature of the official Algerian statistics, trade data were obtained from other sources. Production data for nonpetroleum minerals came from U.S. Embassy despatches that were prepared from data of the "Direction des Mines et de la Géologie." Petroleum and natural gas statistics were largely from "Activité de l'Industrie Pétrolière," published by the Direction des Carburants, Ministère de l'Industrie, Paris.

The Algerian "Bulletin Mensuel de Statistique Générale," by the Sous-Direction des Statistiques, Algiers, contains production and trade statistics on a monthly and/or trimestrial basis; the recent editions show much improvement over the earlier ones. The foreign trade statistics are basically from the European Economic Community publication, "Foreign Trade Statistics, Analytical Tables, Imports and Exports," by the Statistical Office of the European Communities, Brussels.

---

[10] The Institute of Petroleum Review. Algeria's First Major Refinery, v. 18, No. 213. September 1964, pp. 317–319.

[11] The Institute of Petroleum Review. Field Gas Injection at Hassi Messaoud, v. 18, No. 210, June 1964, pp. 196–202.

The Mineral Industry of Angola, Mozambique, and Portuguese Guinea

By William C. Henkes[1]

◆

THE PORTUGUESE overseas Provinces of Angola and Mozambique in 1964 had a combined mineral extractive production, including cement, coal, and crude petroleum, valued at about $63.1 million[2] while similar production in metropolitan Portugal was valued at $39.1 million. Portuguese Guinea had no recorded mineral production.

Angola is an important earner of foreign exchange for the escudo zone, partly through its sales of diamonds and iron ore.[3] Mozambique receives a large amount of foreign exchange through the very important transit trade, particularly in minerals, of its landlocked neighbors to the west.

The mineral production of the two provinces is not large in a worldwide sense, yet some commodities are significant. Angolan diamond production, for example, was 3.2 percent of world diamond production in 1964; Mozambique, in that year, produced 7.4 percent of the beryl and 4.8 percent of the tantalum-columbium concentrates produced in the world.

ANGOLA

With the exception of iron ore and petroleum, the mineral commodities of Angola were produced in 1964 at levels generally slightly higher than in previous years. Production of iron ore increased by 42 percent mainly because of improvements to the Cassinga mine and its facilities. Crude petroleum production was 13 percent above that of 1963 and production of diamonds, Angola's principal mineral commodity, increased 6 percent.

The total value of mineral production in 1964 was nearly $61 million. Diamonds accounted for about 47 percent of this and crude petroleum nearly 24 percent.

At the end of 1963, the latest year for which data are available, there were 56 mines and 4 oilfields in operation; 42 of the mines were diamond workings. Total employees in the extractive industries were

---

[1] Petroleum engineer, Division of International Activities.

[2] Where necessary, monetary conversions have been made at the rate of 1 escudo (Esc.) = U.S. $0.035 (U.S. $1.00=Esc. 28.58).

[3] Coffee is by far Angola's chief export; in 1964, exports of this commodity were valued at $100.1 million.

34,441, of whom 375 were engineers and technicians, 212 were administrators, and the rest were laborers.

GOVERNMENT POLICIES AND PROGRAMS

In June, the Angolan Department of Geology and Mines requested bids on a project calling for mineral exploration and geological mapping (at a scale of 1:100,000) of an area of about 245,000 square kilometers, bounded by meridians 14° and 18° East and parallels 9°30′ and 14°30′ South. This area comprises most of the Angolan highlands and is the most densely populated part of the country. Bids were reported from three foreign groups, two United States and one British, with published bids ranging from $3.5 million to $7.5 million. By yearend, no contract had been awarded.

Plans were announced for building a loading pier for minerals at the port of Luanda. The pier will be 200 meters long and 13 meters deep. It will accomodate freighters of up to 35,000 to 40,000 tons and will handle cargo at the rate of 1,500 tons per hour. This improvement and others at the port are expected to increase annual export capacity of Luanda from 600,000 to 3 million tons.

PRODUCTION

Iron ore production increased sharply because of improvement of facilities associated with the Cassinga deposits and the previously completed Cuima-Vila Robert Williams railroad link.

TABLE 1.—Angola: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Copper:					
Mine	1,917	927	[r] 1,134	130	----------
Smelter	1,582	850	[r] 783	101	----------
Gold ......troy ounces	42	48	77	37	7
Iron ore ......thousand tons	659	812	[r] 754	638	905
Manganese ore	23,340	20,589	[r] 12,781	----------	----------
Nonmetals:					
Cement ......thousand tons	161	157	[r] 169	194	214
Diamonds:					
Gem ......carats	642,551	750,835	762,395	758,570	1,149,068
Industrial ......do	414,276	396,704	318,709	325,000	
Gypsum	[e] 13,000	[e] 13,000	16,305	14,208	----------
Mica:					
Sheet	12	2	----------	----------	----------
Scrap and splittings	327	23	[r] 49	----------	----------
Salt ......thousand tons	58	67	60	69	81
Asphalt, rock	25,783	22,783	36,237	54,741	44,167
Mineral fuels:					
Petroleum:					
Crude	66,848	104,429	471,236	799,657	904,757
Refinery products:					
Gasoline	27,855	34,083	55,235	59,775	53,337
Kerosine and jet fuel oil [r]	----------	2,553	3,625	12,594	35,735
Distillate fuel oil [r]	78,545	90,748	183,755	253,536	258,695
Residual fuel oil [r]	70,672	68,725	89,447	117,773	142,480
Asphalt	----------	----------	2,130	6,071	7,264
Liquefied petroleum gas (LPG)	416	1,596	3,035	4,149	6,118
Total	177,488	197,705	337,227	[1] 453,974	503,629

[e] Estimate.

[r] Revised.

[1] Includes 76 tons of cutbacks.

TRADE

Latest available detailed foreign trade data for Angola are for 1962. However, preliminary data are available on selected mineral commodities for 1963 and 1964, and these have been tabulated.

Because of stringent control of imports, Angola has had a favorable foreign trade balance since 1961. Exports for 1964 were nearly 26 percent more than in 1963, whereas imports were only 12.6 percent more; the resulting balance was more than double that of 1963. Total exports and imports for 1961 through 1964, in millions of dollars, were:

	1961	*1962*	*1963*	*1964*
Exports	135. 6	149. 3	163. 9	205. 4
Imports	114. 4	136. 4	147. 4	165. 0
Balance	+21. 2	+12. 9	+16. 5	+40. 4

Historically, metropolitan Portugal has been Angola's principal trading partner, taking 32 percent of 1964 exports and providing 52 percent of the imports.

The United States was the best foreign customer in 1964, receiving 25.8 percent of the exports; nearly 98 percent was coffee. Manganese was the chief mineral export to the United States; nearly 32 percent of the total went to the United States. The United States supplied 8.7 percent of Angolan imports; lubricants accounted for about 6 percent of U.S. shipments to the country.

TABLE 2.—Angola: Foreign trade of selected metals and minerals, 1963–64

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations and sources, 1964
Exports:			
Metals:			
Copper, unrefined and matte	178	111	NA.
Iron ore	655, 536	1, 127, 548	Mainly to West Germany.
Manganese ore	2, 915	9, 636	Spain 5,580; United States 3,048.
Nonmetals:			
Cement	24, 432	56, 107	NA.
Diamond carats	1, 293, 243	1, 094, 541	Portugal 1,049,148; United Kingdom 45,393.
Salt	24, 341	33, 936	Rep. of the Congo (Leopoldville) 22,455; Southern Rhodesia 4,459.
Mineral fuels, petroleum:			
Crude	317, 715	361, 050	Portugal 291,537; Canada 49,386; Spain 20,126.
Refinery products:			
Gasoline	23, 771	9, 295	Rep. of the Congo (Leopoldville) 8,698; Bunkers 597.
Residual fuel oil	170, 963	200, 140	NA.
Imports:			
Metals: Iron and steel:			
Rolled products	22, 036	29, 922	Belgium-Luxembourg 11,210; France 3,571; West Germany 3,446.
Pipe and fittings	451	484	NA.
Nonmetals:			
Fertilizers, nitrogenous	5, 531	6, 410	Portugal 3,044; Belgium-Luxembourg 1,175 Netherlands 1,060.
Tile and similar products	1, 213	1, 207	Portugal 950; Czechoslovakia 194.
Mineral fuels:			
Coal	4, 186	30, 118	NA.
Coke and semicoke	5, 413	9, 737	NA.
Petroleum, refinery products:			
Gasoline	10, 541	10, 303	Curacao 5,858; Other West Indies 1,698; Iran 1,292.
Kerosine	6, 944	6, 116	Curacao 2,672; Portugal 1,052; Venezuela 909; Iran 554.
Fuel oil, unspecified	15, 774	12, 080	Curacao 10,780; Italy 1,005.
Lubricants	9, 619	9, 531	United States 4,439; Portugal 1,484; United Kingdom 1,333.

NA Not available.

Source: Boletim Mensal. Repartição de Estatística Geral. V. 19, No. 12, December 1963; v. 20, No. 12, December 1964.

The United Kingdom supplied most of Angola's foreign imports in 1964, nearly 10 percent. Lubricants were the principal mineral commodity furnished by that country. Until 1964, the United Kingdom ranked next to the United States as a buyer of Angolan exports, but in that year the percentage of exports taken fell to 3.6 percent from 16 percent in 1963. This reflects the shift in diamond exports from the United Kingdom to Portugal.

In 1962, the last year for which detailed data are available, Angola's mineral exports were valued at $30 million and amounted to 20 percent of total exports. Diamonds, valued at $19.5 million accounted for 65 percent of the mineral exports and 13 percent of total exports. Iron ore was the next most valuable mineral export—worth $4.6 million. Mineral fuels as a group were valued at $4.5 million.

Mineral imports in 1962 were valued at $12.5 million, about 9.2 percent of total imports. The largest single item was rolled products of iron and steel worth $5.2 million. Lubricants, distillate fuel oil, and gasoline were the next most valuable mineral imports, having a total value of $3.5 million; total mineral fuel imports were worth $5.3 million.

TABLE 3.—Angola: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	Principal destinations, 1962
Metals:			
Aluminum, scrap	7	-----	
Copper:			
Matte	82	92	All to Portugal.
Blister	825	766	Do.
Scrap	41	-----	
Other	68	45	Portugal 30; Netherlands 15.
Iron and steel:			
Iron ore	494, 488	445, 987	West Germany 363,616; France 25,052; Netherlands 22,309.
Scrap	7, 400	5, 410	All to Japan.
Rolled products	132	279	Mozambique 134; Equatorial Customs Union 92.
Lead	40	45	Belgium-Luxembourg 40; Portugal 5.
Manganese ore	22, 178	9, 526	Norway 8,407; Japan 1,118.
Zinc	5	1	All to Portugal.
Other	5	2	Mainly to Mozambique.
Nonmetals:			
Cement	8, 948	10, 986	São Tomé 5,415; Equatorial Customs Union 3,620.
Clay	209	-----	
Diamond carats	1, 276, 573	985, 776	All to United Kingdom.
Gypsum	8, 419	6, 758	All to Mozambique.
Mica: Sheet	7	-----	
Stone, building	96	178	Mozambique 81; Portugal 56; France 16.
Salt	25, 059	22, 867	Rep. of the Congo (Léopoldville) 14,513; Fed. o Rhodesia and Nyasaland 4,054.
Other	35	8	All to Portugal.
Mineral fuels:			
Coal, coke, and semicoke	-----	4	All to bunkers.
Petroleum:			
Crude	-----	114, 951	Portugal 114,950; United States 1.
Refinery products:			
Gasoline	1	16, 361	Rep. of the Congo (Léopoldville) 16,352.
Kerosine and jet fuel	1	6	All to bunkers.
Distillate fuel oil	2, 989	3, 552	Do.
Residual fuel oil	72, 840	86, 823	Bunkers 75,446; Rep. of the Congo (Léopoldville) 11,377.
Lubricants	30	15	Bunkers 7; São Tomé 5; Portugal 2.
Liquefied petroleum gas (LPG).	65	7	All to São Tomé.
Other	20	22	Mainly to Mozambique.

TABLE 4.—Angola: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	Principal sources, 1962
Metals:			
Aluminum	414	324	Belgium-Luxembourg 166; West Germany 59; United Kingdom 56.
Copper, all forms	291	422	United Kingdom 122; West Germany 80; Belgium-Luxembourg 76.
Gold troy ounces	100	29	All from United Kingdom.
Iron and steel:			
Pig iron	164	196	Portugal 112; Netherlands 75.
Ferroalloys	7	5	United Kingdom 4; Portugal 1.
Scrap, ferrous	1	292	São Tomé 292.
Ingots, blooms, etc	48	67	West Germany 28; Portugal 26; United Kingdom 12.
Rolled products	27,130	28,065	Belgium-Luxembourg 12,415; France 5,241; West Germany 3,001; United States 1,670.
Lead	80	86	Belgium-Luxembourg 22; Portugal 18; United Kingdom 17; Netherlands 12.
Silver troy ounces	2,107	1,171	France 675; West Germany 257.
Tin long tons	29	41	Portugal 24; Netherlands 10; West Germany 5.
Zinc	64	100	Belgium-Luxembourg 54; West Germany 14; Fed. Rhodesia and Nyasaland 14.
Other:			
Ores, unspecified	118	--------	
Slag and residues, metallic	196	3	All from United Kingdom.
Unspecified	2	[1] 159	Portugal 51; United Kingdom 32; Spain 27; West Germany 15.
Nonmetals:			
Asbestos	713	499	Rep. of South Africa 434; Fed. of Rhodesia and Nyasaland 42.
Brick and tile:			
Common	(2)	1,374	Portugal 762; Czechoslovakia 500.
Refractory	(2)	937	Portugal 921.
Cement	1,135	2,595	Cape Verde 893; Portugal 734; Rep. of the Congo (Léopoldville) 579.
Chalk	151	216	Portugal 105; Belgium-Luxembourg 80; France 30.
Clays	682	333	France 201; Portugal 97; United Kingdom 10.
Diatomite	28	71	United States 34; West Germany 16; Portugal 11.
Fertilizers:			
Nitrogenous	(2)	6,542	Netherlands 2,499; West Germany 1,980; Belgium-Luxembourg 1,609.
Phosphatic	(2)	1,660	Portugal 1,659.
Potassic	(2)	938	France 756; Portugal 139.
Mixed	(2)	884	Portugal 444; Netherlands 200; West Germany 193.
Gypsum	262	188	Belgium-Luxembourg 100; Portugal 78.
Salt	40	40	Portugal 14; United Kingdom 13; Mozambique 12.
Stone, building	469	337	Mainly from Portugal.
Sulfur	552	369	West Germany 298; Portugal 67.
Other	1,230	775	Cape Verde 298; Portugal 204; Algeria 196.
Mineral fuels:			
Coal	23,607	33,071	Rep. of South Africa 28,274; Poland 4,750.
Coke and semicoke	1,542	1,448	West Germany 1,269; Fed. of Rhodesia and Nyasaland 129.
Byproducts of coal	3,000	4,834	Spain 4,454; United Kingdom 265; United States 36.
Petroleum:			
Crude	121,612	--------	
Refinery products:			
Gasoline	17,753	16,073	Curacao 6,731; Iran 2,604; Saudi Arabia 2,033; United States 1,163.
Kerosine and jet fuel	10,891	11,137	Curacao 4,649; Portugal 3,051; Iran 1,280.
Distillate fuel oil	34,843	28,921	Curacao 8,366; Venezuela 7,112; Iran 5,608.
Residual fuel oil	14,988	13,507	Belgium-Luxembourg 6,392; Spain 4,245.
Lubricants	7,476	8,241	United States 4,135; Netherlands 1,292; United Kingdom 1,243.
Liquefied petroleum gas (LPG).	325	24	Portugal 19; West Germany 3.
Asphalt and bitumen	922	3,753	Spain 3,648; United States 42; Netherlands 40.
Other	669	104	United Kingdom 36; United States 17; Belgium-Luxembourg 11.

---

[1] Includes 145 tons of metallic oxides.

[2] Included in "Other."

COMMODITY REVIEW

Metals.—*Copper.*—No copper was produced in 1964 as a result of depletion of the Mavoio copper mine in 1963. It was reported that the Angolan Copper Co., a subsidiary of the Cia. Uniao do Fabril, planned to commence production at the Tetelo deposit where exploration had been in progress for 3 years. The deposit reportedly contains several million tons of ore with an average copper content of 3 percent. Development and equipment costs were estimated at about $35 million.[4]

Gold.—In September, reports were published of finding gold deposits approximately 70 kilometers from Novo Redondo.[5] No indication was given as to the extent or location of the deposit.

Iron Ore.—The nearly 42 percent increase in iron ore production in 1964 brought output of this commodity to a record high. The Companhia Mineira do Lobito in association with Krupp of Essen, West Germany, and other European groups, continued improvements of facilities associated with the Cassinga mine in southern Angola. Revised plans called for an output from the mine of about 3 million tons of ore per year by 1966 and eventually 5 million tons annually. Cassinga's reserves of high-grade ore (62 percent or more iron) in 1964 were estimated at 110 million tons. Shipping specifications for the ore were reported to be 64 percent iron, 0.05 to 0.08 percent phosphorous, 0.005 percent sulfur, and 6 to 10 percent total aluminum oxide and silica.[6]

At yearend the Cia. Mineira do Lobito was negotiating with Japanese steel companies for the sale of 15 million tons of Lobito iron ore during a 10-year period.

Exports of iron ore through the ports of Luanda, Lobito, and Mocamedes were 487,000, 361,000, and 279,000 tons, respectively.

Iron and Steel.—In November 1964, the first shipment was made from Angola of iron construction rods made from scrap iron and steel. It was expected that this 61-ton export would be quickly followed by other and larger shipments.

Manganese Ore.—It was reported in June that a group of Portuguese, French, and German investors was planning to produce manganese ore in Cabinda. Potential productions was estimated at 100,000 tons per year. The group reportedly had authorization from the Republic of Congo (Brazzaville) to ship the ore via Pointe Noire.[7]

Exports of manganese ore in 1964 totaled 9,636 tons, all through the port of Luanda.

Nonmetals.—*Diamond.*—Diamond continued to be Angola's chief mineral product. Exports for 1964 amounted to 1,094,541 carats, worth about $26.2 million; this was nearly 13 percent of the value of total exports for the year and far exceeded the value of all other mineral exports. For the first time, Angolan diamonds were exported to a destination other than the United Kingdom; about 96 percent of the total exports (1,049,148 carats) went to Portugal.

In August, the Government granted prospecting rights for diamond and other precious stones to the Angolan Exploration Co., Ltd., in a concession area of about 64,000 square kilometers along the coast from Ambriz to Baia des Tigres. Angolan Exploration is a South African firm operating out of Johannesburg.

---

[4] Mining Journal (London). V. 263, No. 6727, July 24, 1964, p. 66.
[5] Mining Journal (London). V. 263, No. 6733, September 4, 1964, p. 175.
[6] Mining Journal (London). V. 264, No. 6766, April 23, 1965, p. 311.
[7] U.S. Consulate, Luanda. A-6, July 8, 1964.

Other Nonmetals.—The Angolan Department of Geology and Mines reported late in the year that new deposits of mica and pyrite had been discovered about 65 kilometers from Novo Redondo. The mica deposits were at N'Dui and the pyrite deposits were at Baleia.

Mineral Fuels.—*Petroleum.*—Crude petroleum production at year-end was about 23,600 barrels per day, an increase of 7,000 barrels per day from 1963.[8] Output of refined products increased nearly 11 percent.

In March, the Companhia de Petroleos de Angola (Petroangol) placed a contract for the construction of a coastal tanker. The ship, to be built at Aveiro, will be 250 feet long, will have a capacity of 3,100 tons, speed of 11.5 knots, and range of 4,500 miles. It will move oil from Luanda to other Angolan ports and possibly to neighboring countries.

The Cabinda Gulf Oil Co. (subsidiary of the Gulf Oil Corp.) drilled an unsuccessful exploratory well on its Cabinda concession. The well was located about 22 kilometers south of the city of Cabinda and cost approximately $800,000; some oil was recovered on tests, but no announcement was made of plans for additional drilling.

In November, the Angolan press reported that an agreement had been reached between South African business interests and Angolan petroleum companies by which new wells would be drilled in the Quicama producing area and exploration would be done in new areas. It was planned that petroleum production would be increased to about 5 million tons annually and that a pipeline would then be built to the border of South-West Africa.

Consumption of major petroleum fuels during 1963 and 1964 were:

	Quantity (42-gallon barrels)	
	1963	*1964*
Gasoline	527, 600	530, 460
Jet fuel	73, 180	228, 600
Distillate fuel oil	954, 460	1, 032, 760
Residual fuel oil	449, 760	481, 830
Butane	25, 840	38, 480

SOURCE MATERIALS

Production data were obtained from Boletim Mensal, published monthly by the Repartição de Estatística Geral of the Direcção dos Serviços de Economia e Estatística Geral for the Province of Angola. Recent (1963 and 1964) foreign trade data also were taken from this publication.

Detailed foreign trade data were obtained from Comércio Externo, volume 1, published annually by the Repartição de Estatística Geral.

General information was taken from despatches of the U.S. Consulate, Luanda, and from trade journals.

---

[8] Oil and Gas International. V. 5, No. 3, March 1965, p. 39.

MOZAMBIQUE

The mineral industry of the Province of Mozambique operated at a slightly lower level than in former years; the notable exception was production of tantalum and columbium concentrates, which increased 30 percent.

Improvements in transportation facilities, including ports and pipelines, were primarily for the in-transit shipment of minerals and fuels from and to neighboring countries. Benefits, however, to the domestic mineral industry are great and will increase with time.

The value of 1964 mineral industry production was $7,059,000. The most valuable products were cement, $4,482,000; tantalum and columbium concentrates, $1,358,000; and coal, $1,071,000. These figures do not include the values of sand and gravel, common clay, limestone, granite, and certain other quarry products for which no values were available.

GOVERNMENT POLICIES AND PROGRAMS

The Government continued its policy of encouraging economic growth of the province while strengthening its ties to metropolitan Portugal. In 1964, import duties were removed from certain traditional imports of Portuguese manufacture in exchange for similar treatment of some Mozambique commodities sent to Portugal.

A new tariff schedule was introduced in June 1964. Based on the Brussels Tariff Nomenclature, it provides *ad valorem* duties for approximately 50 percent of the commodities and duties for the remainder by specific unit basis for instance, size, volume, or weight.

Late in the year, trade agreements were made with the Republic of South Africa. Discussions were also underway at yearend with the Governments of Rhodesia and Malawi relative to trade with these countries.

The rate of exchange of the Mozambique escudo was adjusted slightly five times during the last half of 1964. The last change was on December 21, when the rate was fixed at Esc.28.65=US$1.00.[9]

Of particular importance to the minerals industry were the construction of an ore-loading wharf at Matola and the building of a railway from the Swaziland border to Matola.

The ore-loading wharf at Matola, an industrial suburb of Lourenço Marques, and the railroad are integral parts of the Swaziland iron-ore project that calls for annual movement of 1.5 million tons of iron ore through the port en route to Japan. The wharf, costing about $4.2 million, is the largest such facility in southern Africa. Highly automated, the wharf has stockpiles with a capacity of 800,000 tons, of which 150,000 tons are reserved for Swaziland iron ore. Two ships' loaders have rated capacities of 1,000 tons per hour each.[10] The harbor channel was deepened to accept three large, specially built ore-carriers which will operate a regular 20-day shuttle service to Japan. The first of these ships, the 80,000 ton Japanese *Inayama* (reportedly the world's largest ore vessel) was loaded from December 4 to 8, 1964, with approximately 60,000 tons of iron ore.[11] The wharf actually commenced operations on November 7, 1964.

---

[9] U.S. Consulate, Lourenço Marques. A–242, April 2, 1965.

[10] South African Mining and Engineering Journal. V. 75, pt. 2, No. 3746, November 20, 1964, p. 1431.

The railroad was built following an accord reached between Portugal and the United Kingdom and signed April 7, 1964. The Portuguese built the railway between the port and the Swaziland border near Goba, and the British built the section from there to Ngwenya, Swaziland; freight and passenger service began September 1, 1964.

PRODUCTION

With the principal exceptions of tantalum-columbium concentrates and refined petroleum, production of practically all mineral commodities continued to decline. Output of refined petroleum products made from imported crude oil has grown steadily since the Matola refinery was completed in 1961; total output in 1964 was 9 percent more than that of 1963 and 13 percent greater than 1961 production.

Because of the increased production of the tantalum mineral, microlite, the decline of tantalite output was more than offset, and the combined production showed an increase of 30 percent.

TABLE 5.—Mozambique: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1960	1961	1962	1963	1964
Meatls:					
Bauxite	4,840	4,671	6,216	6,597	6,278
Beryl	1,496	973	[r] 574	556	383
Bismuth ... kilograms	13,600	[r] 22,050	[r] 8,458	[r] 13,786	8,027
Cesium mineral, pollucite	----	4	----	NA	4
Columbium and tantalum concentrate [2] ... do	152,174	168,715	155,208	153,280	199,787
Copper ore, unspecified	----	----	----	----	29
Gold ... troy ounces	225	[r] 105	[r] 91	[r] 29	40
Titanium concentrate, ilmenite	[r] 771	----	----	----	----
Nonmetals:					
Asbestos	20	147	336	----	----
Cement ... thousand tons	222	212	179	167	182
Clay:					
Common	121,570	129,449	90,573	NA	NA
Kaolin	[r] 150	120	180	5	10
Montmorillonite	40	[e] 40	37	800	828
Diatomite	93	360	350	----	----
Granite	610,566	730,394	387,267	NA	NA
Lime	10,515	7,454	6,543	NA	NA
Limestone	453,650	433,817	318,129	NA	NA
Lithium and lepidolite	1	154	274	104	----
Mica, including scrap	1	[r] 2	1	----	----
Phosphate rock and guano	[r] 133	----	----	----	----
Salt	[r] 29,054	[r] 22,384	[r] 27,546	[e] 27,000	NA
Sand and gravel	208,234	130,489	205,218	NA	NA
Tourmaline ... kilograms	[e] 300	289	522	316	[p] 2,455
Other quarry products	108,957	62,574	87,550	NA	NA
Mineral fuels:					
Coal (bituminous) ... thousand tons	270	321	298	283	245
Petroleum, refinery products:					
Gasoline	----	84,310	91,787	94,303	101,627
Distillate fuel oil	----	125,213	116,645	116,734	133,820
Residual fuel oil	----	218,143	214,411	230,659	246,261
Butane	----	----	----	1,337	2,239
Total	----	427,666	422,843	443,033	483,947

[e] Estimate.
[r] Revised.
NA Not available.
[p] Preliminary.
[1] In addition, 1963–64 mineral production included quarry products for which detailed statistics are not available.
[2] Microlite is a major part of this: In 1962, 52,600 kg.; in 1963, 72,600 kg.; and in 1964, 154,117 kg.

---

[11] U.S. Consulate, Lourenço Marques. A–156, December 15, 1964.

TRADE

The primary importance of Mozambique to world mineral trade continued to be its principal ports, Beira and Lourenço Marques, which remained shipping points for mineral exports from and imports to Zambia, Southern Rhodesia, Republic of the Congo (Leopoldville), Swaziland, and the Republic of South Africa. Data on these in-transit movements are not included in official trade statistics.

Detailed data on exports of mineral commodities from Mozambique, as well as on imports of these materials for domestic consumption have not been available for any year since 1961. Those data were reported in Volume IV, Minerals Yearbook 1963, pages 1,017–1,019.

In 1964, recorded mineral and coal exports were valued at $1.74 million, or 1.6 percent of total exports valued at $106.21 million; this was a slight improvement from 1963 when these commodities were valued at $1.48 million. Exports of refined petroleum products were valued at $7.92 million in 1964, compared with $8.59 million in 1963.

Portgual received 32.4 percent of the total exports; India, Republic of South Africa, and the United States (4.8 percent) followed in that order. The U.S. share dropped slightly from 4.9 percent in 1963.

The value of imports of selected commodity groups and of total imports in 1963 and 1964 were as follows:

Commodity group:	*Value, million U.S. dollars*	
	1963	*1964*
Selected mineral groups:		
Steel products	$6.4	$10.8
Fertilizers	1.0	1.4
Coal and coke	1.3	1.4
Crude oil	7.3	7.8
Refined petroleum products	2.6	5.0
Total	18.6	26.4
Other commodities	121.8	130.4
Grand total	140.4	156.8

Portgual, in 1964, continued to be the chief supplier of imports by Mozambique, supplying 31.8 percent of the total. The Republic of South Africa, the United Kingdom, and West Germany were next in order of value. The United States ranked seventh with 3.7 percent—a sharp decline from 6.0 percent in 1963. Iraq continued to supply crude oil for the Matola refinery; thus is ranked fifth among sources of imports.

The ports of Lourenço and Marques and Beira handled 4,748,000 tons of incoming cargo and 6,304,000 tons of outgoing cargo in 1964. At Lourenço Marques, crude oil and petroleum refinery products accounted for 1,824,012 tons (61 percent) of the incoming cargo of

2,986,555 tons. Minerals (2,497,393 tons), fuel oil (406,766 tons), and coal (609,712 tons) accounted for 3,513,871 tons (76 percent) of exports of 4,597,211 tons. At Beira, fuel and cement (582,814 tons and 536 tons, respectively) comprised 33 percent of the 1,761,828 tons which entered the port; minerals (935,633 tons) amounted to 55 percent of outgoing tonnage.[12]

The quantity of minerals and fuels going out of each of these ports increased by 20 percent, mainly because of the improvement and expansion of port facilities, already discussed.

An illustration of the importance of Mozambique's ports to the movement of minerals from neighboring countries is seen in the details of exports from Beira during November 1964. During this month, the following minerals were loaded: Asbestos, 1,247 tons; copper, 39,228 tons; chromite, 2,804 tons; zinc, 6,306 tons; and miscellaneous ores, 23,854 tons.

TABLE 6.—Mozambique: Exports of major metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Selected destinations, 1963 [1]
Metals: [2]			
Aluminum	----------	71	West Germany 36; Belgium-Luxembourg 34.
Copper, scrap	247	280	West Germany 158; Portugal 67.
Iron and steel:			
Ferrous scrap	3,371	4,742	Rep. of South Africa 1,372.
Rolled products	----------	15	All to Portugal.
Lead	NA	[3]157	Portugal 20.
Zinc	NA	2	Portugal 1.
Metallic ores, unspecified	6,358	5,935	Mainly to Rep. of South Africa.
Nonmetals:			
Asbestos	[e] 95	[e] 45	All to Portugal.
Salt	NA	3,432	Mainly to Rep. of South Africa.
Other, unspecified	[e]3,135	4,928	NA.
Mineral fuels:			
Coal and coke	52,756	63,340	Fed. of Rhodesia and Nyasaland 45,835.
Petroleum, refinery products:			
Gasoline	NA	84,208	Rep. of South Africa 50,272.
Kerosine	4	2,342	All to Rep. of South Africa.
Fuel oil, unspecified	[p] 17,836	329,570	Rep. of South Africa 52,886; Portugal 18,816.
Lubricants	NA	4	All to Portugal.

[e] Estimate.
[p] Preliminary.
NA Not available.
[1] No data available from Mozambique official sources; data cited is from (1) Analytical Tables, Foreign Trade, Statistical Office of the European Communities, Brussels; (2) Foreign Trade Statistics, v. 1, 1963, Dept. of Customs and Excise, Rep. of South Africa; (3) Annual Statement of External Trade, 1963, Central Statistical Office, Fed. of Rhodesia and Nyasaland; and (4) Comércio Externao, v. 2, 1963, Instituto Nacional de Estatistica, Portugal.
[2] Includes unwrought, scrap, and semimanufactures.
[3] Probably mainly to Rep. of South Africa.

---

[12] Boletim, Portos, Caminhos de Ferro e Transporteo de Moçambique. 1965, No. 3, March 1965, pp. 28–31.

TABLE 7.—Mozambique: Imports of major metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Selected sources, 1963[1]
Metals:[2]			
Aluminum	75	394	West Germany 58; Belgium-Luxembourg 15.
Copper	281	667	Belgium-Luxembourg 116; West Germany 10.
Iron and steel:			
Ingots and similar products	31	3,604	Rep. of South Africa 2,362; Portugal 1,029.
Scrap	37	144	All from Fed. of Rhodesia and Nyasaland.
Rolled products	27,333	38,246	Rep. of South Africa 21,794; Belgium-Luxembourg 5,330; France 4,277; West Germany 3,450.
Lead	9	116	NA.
Other, unspecified	58	112	Portugal 24; Fed. of Rhodesia and Nyasaland 9.
Nonmetals:			
Asbestos	3,377	1,395	Fed. of Rhodesia and Nyasaland 988; Rep. of South Africa 407.
Brick and tile	592	841	Mainly from Portugal.
Cement	565	381	Portugal 268; Rep. of South Africa 113.
Fertilizers	[e] 14,681	17,311	West Germany 6,177; Portugal 4,024; Rep. of South Africa 787.
Sand and gravel	1,062	738	All from Portugal.
Stone, building	525	386	All from Portugal.
Sulfur	832	499	West Germany 485; Portugal 10.
Mineral fuels:			
Coal and coke	324,007	293,031	Mainly from Rep. of South Africa.
Petroleum:			
Crude	399,053	436,820	NA.[3]
Refinery products:[4]			
Gasoline	18,721	10,588	NA.
Kerosine	16,789	16,133	NA.
Fuel oil, unspecified	31,557	18,669	NA.
Lubricants	6,229	6,591	NA.

[e] Estimate.

NA Not available.

[1] No data available from Mozambique official sources; data cited is from (1) Analytical Tables, Foreign Trade, Statistical Office of the European Communities, Brussels; (2) Foreign Trade Statistics, v. 1, 1963, Dept. of Customs and Excise, Rep. of South Africa; (3) Annual Statement of External Trade, 1963, Central Statistical Office, Fed. of Rhodesia and Nyasaland; and (4) Comércio Externo, v. 2, 1963, Instituto Nacional de Estatística, Portugal.

[2] Includes unwrought, scrap, and semimanufactures.

[3] Believed to be all from Iraq.

[4] Assumed to be for local consumption; data from source countries indicate much larger amounts, probably in transit to Rep. of South Africa and Fed. of Rhodesia and Nyasaland.

COMMODITY REVIEW

Metals.—*Copper.*—In 1964, Edmundian Investments (Prop.), Ltd., produced 29 tons of copper concentrates at its mine near Manica, District of Manica e Sufala. At least 20 tons were exported to Sweden.

Iron Ore.—The Mozambique press reported early in the year that unspecified foreign firms were interested in iron ore deposits near Namapa, District of Moçambique. These sources gave analysis of the ore as 92.75 percent iron-oxide (iron 64 percent) and 0.2 percent titanium.

Iron and Steel.—The foundry and steel rolling mill of Companhia Industrial de Fundicão e Laminagem (SIFEL) in Lourenço Marques had a reported rolling capacity of 12,000 tons of steel per year and employed about 200 persons.

Tantalum and Columbium.—Production of tantalum and columbium concentrates reversed its recent downward trend with a 30 percent increase in 1964; this was mainly the result of steadily increasing microlite production, which offset the decrease in columbite-tantalite output. In value, these are by far the most significant metallic minerals produced in the country; the 1964 output was valued at about $1.4 million, 91 percent of the metallic mineral production.

Nonmetals.—*Diamond.*—A concession for diamond exploration was granted to two Portuguese citizens. The area is in the District of Gaza and, is bounded by the South African and Southern Rhodesian borders, the 22° South and 24° South parallels and the 33° East meridian; the concession includes lake, river, and streambeds within the area. Terms of the contract call for a minimum capitalization of $420,000 and retention within Mozambique of 50 percent of net profits.

Mineral Fuels.—*Coal.*—Output of bituminous coal from the Moatize mine of Companhia Carbonifera de Mozambique continued its decreasing trend of recent years. Value of coal production for 1964 was $1.1 million, ranking this commodity third in value among the minerals.

Press reports attributed at least part of this decrease to the fact that Malawi was not purchasing Moatize coal for its thermoelectric plant at Blantyre. This plant used Mozambique coal for the past 11 years during which time consumption increased from 295 tons in 1953 to 32,495 tons in 1963; between January and September 1964, however, the plant used only 5,685 tons of Moatize coal.

Petroleum.—At yearend, the Sociedade Nacional de Refinação de Petróleos (SONAREP) announced expansion plans for its Lourenço Marques refinery. At an estimated cost of $3.15 million, beginning in early 1965, the refinery's crude oil capacity was to be increased to 1 million tons annually. An asphalt unit having an annual capacity of 118,000 tons, and a liquefied petroleum gas (LPG) unit having an annual capacity of 25,000 tons, were to be added. The company stated that its operations to date had saved Mozambique more than $16.5 million in foreign exchange.

The Companhia do Pipeline Moçambique-Rhodesia (with Portuguese, British, and Rhodesian capital) completed a 227-kilometer, 10-inch crude-oil pipeline from Beira to the 20,000 barrel-per-day Rhodesian refinery at Feruka, near Umtali. Cost of the pipeline was about $12.6 million,[13] and daily capacity, initially, is 17,000 barrels per day. However, with addition of two more pump stations it is expected to reach a capacity of 35,000 barrels per day in 1972. The first crude oil moved through the line on December 22, 1964. Continuous pumping was expected to begin in early January 1965. The pipeline will reportedly earn for Mozambique an annual revenue of about $4.2 million.

SOURCE MATERIALS

Production data for Mozambique were obtained by the U.S. Consulate, Lourenço Marques, from the Direcção dos Servicos de Geologia e Minas.

Trade data, as well as other statistical data, were taken from the following publications of the Direcção Provincial dos Servicos de Estatística Geral: Estatística Industrial, 1962; Anuário Estatístico, 1963; and various issues of Boletim Mensal de Estatística.

---

[13] U.S. Consulate, Lourenço Marques. A-71, August 25, 1964.

In addition, publications of the Instituto Nacional de Estatística, Lisbon, Portugal, were used: Anuário Estatístico, v. 2, Ultramar, 1963; and Comércio Externo, v. 2, 1962 and 1963.

General data were supplied by the U.S. Consulate, Lourenço Marques, the Regional Minerals Officer, Johannesburg; and by numerous trade journals.

PORTUGUESE GUINEA

Neither production of minerals in nor exports of minerals from Portuguese Guinea have been reported for 1963 and 1964. There has been speculation that bauxite may occur in the territory adjacent to Guinea, apparently an extension of deposits now worked in that country, but no plans for exploration or development have been reported.

No petroleum exploration has been reported since 1961, when operations conducted by ESSO Guiné were terminated, the concession relinquished, and the company liquidated.

The Mineral Industry of Basutoland, Bechuanaland, and Swaziland

By Charles L. Kimbell[1]

⁂

COMMERCIAL mineral production of the British High Commission Territories of Basutoland, Bechuanaland, and Swaziland in 1964 was again confined to relatively few commodities, of which asbestos was the most important internationally. The major new development of 1964 was the start of iron ore production in Swaziland, entirely destined for Japanese markets. Each of the Territories continued to be administered by a Resident Commissioner responsible to the High Commissioner, who is appointed by the Queen and responsible to the Secretary of State for Commonwealth Relations. Progress continued in efforts to make the Territories self-governing.

BASUTOLAND

Through 1964, alluvial diamonds, produced in small quantities by individual Basuto diggers, continued as the only significant mineral operation in Basutoland. Prospecting by the De Beers organization of kimberlite occurrences previously discovered reportedly was terminated,[2] but a technical aid team from the British Ministry of Overseas Development carried out investigations of these occurrences to determine if the diamond content is sufficient to justify small scale work by Africans.[3] Low grade tin deposits also were studied. Activities of Basutoland Factory Estates Development, Ltd., a company nominated in 1963 by the territorial government to further diamond exploration, were not reported. Data on output in 1964 are not available; production in 1963 totaled 5,110 carats valued at $214,792.[4]

BECHUANALAND

Recorded mineral production in Bechuanaland in 1964 continued to be limited to manganese ore, chrysotile asbestos, and very minor amounts of gold and silver. Prospecting for copper and fluorspar by Roan Selection Trust Ltd. (formerly Rhodesian Selection Trust, Ltd.)

---

[1] Physical scientist, Division of International Activities.

[2] Mining Journal (London). 1965 Mining Annual Review, June 1965, p. 185.

[3] Mining Journal (London). V. 264, No. 6754, Jan. 29, 1965, p. 77.

[4] Where necessary, values have been converted from South African Rands (R) at the rate of R1=US$1.40.

continued, but no significant developments were announced. Estimated mineral production value totaled $552,000, while mineral exports were reportedly valued at $399,790.

GOVERNMENT POLICIES AND PROGRAMS

Through 1964, ownership of mineral rights was divided between the Territorial government, which controlled all Crown Lands, and the eight tribal chiefs, each of whom controls the rights within his respective tribal territory.

PRODUCTION AND TRADE

Manganese output, although reported to be 228 percent of that recorded for 1963, was far short of the target of about 60,000 tons per year announced in early 1963. Asbestos production declined slightly, reportedly because of market weakness.[5] Precious metal production (as measured by export sales), quite small in 1963, diminished to virtually nothing in 1964.

Exports of manganese ore in 1964 totaled only 11,978 tons, less than half of recorded output, while asbestos exports at 1,820 tons were only 140 tons less than reported production.

The reported value of mineral exports in 1964 totaled $399,790, of which asbestos accounted for 69 percent and manganese ore accounted for 31 percent. (Gold and silver export values were less than one-tenth of 1 percent.)

Comparable figures for 1963 were total exports—$515,756, of which asbestos contributed 59 percent, manganese ore 40 percent, and precious metals about 1 percent. Using unit values of asbestos and manganese exported, and assuming that the part of production not exported was of the same grade as that sold, total production value was estimated at $552,000.

TABLE 1.—Bechuanaland: Production of metals and minerals

Commodity[1]	1960	1961	1962	1963	1964
Metals:					
Gold .... troy ounces..	203	261	288	142	9
Manganese ore .... metric tons..	22,709	28,791	24,002	10,776	24,599
Silver .... troy ounces..	24	39	33	21	1
Nonmetals:					
Asbestos, chrysotile .... metric tons..	1,163	1,745	2,155	2,148	1,960

[1] In addition, construction materials such as clay, sand, and gravel presumably were produced, but quantitative data are not available.

COMMODITY REVIEW

Metals.—*Copper.*—Roan Selection Trust Ltd. reportedly has found significant copper reserves about 100 kilometers west of Francistown in the Matsitamma area, but no decision was reported on their possible development.

---

[5] Mining Journal (London). 1965 Mining Annual Review, June 1965, p. 185.

Gold.—The decline in gold output resulted from the closure during the year of Bechuanaland's last operating gold mine—1 of about 60 in the Tati Concession. Most of these mines, closed since before 1900, were abandoned once refractory ore was encountered, because the technology and equipment of that time precluded continued economic exploitation. No recent assessment of the economic potential of these properties (in the light of 1964 technology) has been made, and the Tati Company, which controls the mineral rights, has not indicated an interest in such work.

Manganese.—Bechuanaland's entire 1964 output of manganese came from the mine of Bamalete Manganese (Pty.), Ltd., at Ootsi, about 18 kilometers north of Lobatsi. Reserve at this property, operated since mid-1962, was not reported on a tonnage basis, but was described as patchy, hard to estimate, and not particularly large. The Territory also has an undetermined reserve of battery grade manganese ore in the Lobatsi Block, an extension of deposits being worked in 1964 across the border in Transvaal, South Africa. Reportedly there was a possibility at yearend that mining might start on these reserves under a contract with Everready of South Africa. Prospecting in this area was conducted by Marble Lime and Associated Industries, Ltd., to whom mineral rights in the Lobatsi Block were ceded for an unreported period by the owners, the British South Africa Co.

Nonmetals.—*Asbestos.*—Bechuanaland's asbestos production in 1964 was all from the Moshaneng mine of Marlime Chrysotile Asbestos Corp., Ltd., about 13 kilometers west of Kanye. The firm reportedly was making efforts to enter the asbestos fiber filter market, a use for which the Bechuanaland asbestos reportedly would be quite suitable because of its low iron content.

Diamond.—Reports on the outcome of exploration by Kimberlite Searches, Ltd., a subsidiary of De Beers Consolidated Mines, Ltd., have conflicted. Through yearend, no announcement of significant discoveries had been made, but the Director of the Bechuanaland Geological Survey Department indicated that some encouraging indications had been found in the northern Bamangwato Tribal Territory, west of Francistown.

Fluorspar.—The Marlime Chrysotile Asbestos Corp., Ltd., carried out diamond drilling in an area of fluorspar deposits about 3 kilometers long in the Bangwaketse Tribal Territory under a Crown Grant conferring prospecting rights.

Salt and Soda Ash.—A subsidiary of Roan Selection Trust, Ltd., determined that brines in the Sua Pan in the Makarikari Pans area are sufficient to permit annual production of 60,000 to 100,000 tons of soda ash and 40,000 tons of salt. A proposed scheme for exploitation would involve pumping the brines through pipes to the railway at Nata, where a refinery would extract and separate the sodium carbonate and sodium chloride. Output might be marketed in South Africa, which was still at yearend cut off from its traditional source of supply, Kenya, by a Kenyan boycott. However, by yearend, economic studies of the Bechuanaland deposits were not complete, and no positive steps toward development had been reported.

Mineral Fuels.—*Coal.*—Bechuanaland's coal deposits remained unexploited in 1964, but it is possible that development of other mineral industries (salt, soda ash and/or copper production) in the Territory might raise industrial coal requirements to the 20,000–30,000-ton-per-month level believed necessary for economic exploitation of these resources. The Territory has three known coalfields, of which the Mamabule field, with total proven reserves of about 408 million tons, is the largest. The coal is low to medium rank noncoking bituminous coal, with a high moisture content, and, as such, is not regarded as economically suitable for export.

Petroleum.—After several years in which no serious petroleum exploration was conducted, the Territorial Government granted a 1 year exploration concession to Philadelphia Oil Company of California, Ltd., a company formed in the United Kingdom by W. P. Blair, a U.S. citizen. The concession covers an area of about 31,000 square kilometers in the Kgalagadi District in the southwest corner of the Kalahari Desert.

SWAZILAND

The mineral industry of Swaziland, an important contributor to the territory's economy for many years, increased its importance in 1964 as the first iron ore from the new Ngwenya mine was shipped to Japan. Asbestos continued to rank as Swaziland's most valuable mineral product in 1964, accounting for about 86 percent of the total value of mineral production of $8.4 million, compared with about 12 percent accounted for by iron ore, and 2 percent accounted for by all other mineral products. Full year production of iron ore expected in 1965 should raise the contribution of that commodity to the value of output considerably, and may rank it on a par with if not ahead of asbestos as a source of income to the territory.

PRODUCTION AND TRADE

Iron ore output commenced in October, and indications were that the originally planned annual production rate of about 1.2 million tons would have to be exceeded in order to meet an expanded contract commitment.

Asbestos production increased as a result of mining modifications at the only producing mine, in spite of market weakness. Variations in output levels of other commodities had relatively little influence on the overall value of mineral output, which increased greatly as a result of the start of iron mining.

Details on mineral and metal trade of Swaziland are not reported, but by far the greatest share of mineral output was exported; the lack of a processing industry for crude or semimanufactured mineral commodities kept imports at token levels except for fuels.

TABLE 2.—Swaziland: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity [1]	1960	1961	1962	1963	1964
Metals:					
Beryl	5	6	----------	2	----------
Gold, troy ounces	806	1,325	2,214	2,092	2,078
Iron ore	----------	----------	----------	----------	[r] 134,733
Tin in concentrates, long tons	6	5	5	3	3
Silver, troy ounces	58	103	132	120	130
Nonmetals:					
Asbestos, chrysotile	29,054	27,934	29,783	30,255	36,162
Barite	181	412	62	84	15
Diaspore	750	446	203	58	374
Kaolin	----------	53	2,488	2,007	312
Pyrophyllite	1,555	2,681	3,540	2,769	1,996
Mineral fuels:					
Coal:					
Anthracite	7,880	938	----------	----------	----------
Bituminous	3,774	42	----------	----------	4,073

[r] Revised.

[1] In addition, construction materials such as clay, sand, and gravel are presumably produced but quantitative data are not available.

COMMODITY REVIEW

Metals.—*Gold.*—Investigations of the geology of the Barberton Mountainlands gold reefs, conducted in collaboration with the Republic of South Africa, continued through yearend. Reportedly, there were indications that limited scale mining operations could be supported.[6]

Iron Ore.—Swaziland joined the ranks of the world's iron ore producers in October when the rich open pit Ngwenya mine of Swaziland Iron Ore Development Co., Ltd., commenced production. By yearend, 134,733 tons of ore had been railed to the specially built ore loading facility at Matola (the industrial port for Lourenço Marques, Mozambique) and of this, 60,192 tons had been shipped to Japan.

The mine north of Mbabane at Bomvu Ridge reportedly had proven reserves totaling about 42.6 million tons of direct shipping ore averaging about 62 percent iron.

During 1964, negotiations were completed with the ore buyer, a Japanese consortium headed by Yawata Iron and Steel Co. and Fuji Iron and Steel Co., Ltd., for the sale of 2.5 million dry metric tons of ore in addition to the 12.2 million tons already committed, raising the total tonnage to be sold within the 10-year contract period to 14.7 million metric tons.

Nonmetals.—*Asbestos.*—The Havelock mine of New Amianthus Mines (Pty.), Ltd., continued as the sole Swaziland producer of asbestos, and expanded output in spite of general market weakness. The property, one of the free world's major sources of spinning grade asbestos, apparently completed the expansion program underway in 1963.

Other.—Despite hopes in 1963 for expanded production of barite, kaolin, and pyrophyllite, output of each of these commodities declined, apparently because of lack of markets.

---

[6] Mining Journal (London). 1965 Mining Annual Review. June 1965, p. 185.

Mineral Fuels.—*Coal.*—Coal production was resumed in Swaziland after more than 2 years in which no coal was produced. The single producer, the Mpaka colliery of Crown Mining and Finance, opened late in 1964 on Crown Mineral Area 9, to supply the new railroad, two sugar mills, other Swaziland industries, and household consumers. Output is a low-volatile bituminous coal.

Petroleum.—The Swaziland Geological Survey and Mines Department reported that it had received an application for petroleum prospecting rights for the whole of the country from an unnamed applicant in 1964, but this was not yet granted. The applicant was the first such application ever filed in Swaziland.

The Mineral Industry of the Republic of the Congo (Léopoldville)

By William C. Henkes[1]

❖

THE YEAR 1964 was generally a good one for the mineral industry of the Republic of the Congo (Léopoldville) despite civil disorders which disrupted most of the eastern part of the country during the last half of the year. Mineral exports for the year were valued at $263.3 million, 72 percent of the country's total exports and 23.4 percent above the value of minerals exported in 1963. Total exports for 1964 were valued at $366.7 million, 94 percent of the value of total exports for 1958 (the last year before independence for which complete data are available).[2]

The monetary reforms instituted in November 1963, particularly in credit restraint and wage and price controls, had beneficial effects on the country's general economy in early 1964. The rebellion against the central government in Léopoldville which began in April 1964 nullified much of this improvement. Economic activity in the eastern Congo was paralyzed: Communications were disrupted, transportation facilities were destroyed, mining and other companies lost most of their trucks, and exports from the area were stopped. Very large unforeseen expenses were involved in suppressing the revolt. Much of the gold, tin, and columbium-tantalum production of the eastern provinces was lost, but of much greater importance was the loss of many of the better-educated Congolese and European staff personnel.

The Union Minière du Haut Katanga, a public company owned largely by Belgian and British stockholders with a significant part owned by the former Belgian Congo Government,[3] was a major factor in the nation's economy. The company and its immediate subsidiaries produced more than 58 percent of the value of the recorded mineral production of 1964; it accounted for all of the copper, zinc, cobalt, cadmium, and germanium production. Its associated and subsidiary companies provide or produce such varied materials and services as electricity, municipal water, building construction, grain-milling, cement, explosives, and crushed stone.

---

[1] Petroleum engineer, Division of International Activities.

[2] Where necessary, monetary conversions have been made at the following rates: Prior to November 1963, 65 Congo francs (CF) = US$1; since that date a dual rate of exchange has been in use: 180CF=US$1 for buyers of foreign exchange and 150CF=US$1 for sellers of exchange.

[3] At yearend, negotiations were underway to transfer this block to the Republic of the Congo (Léopoldville).

The company reported a net profit for 1964 of $11.3 million. In comparison, the Congo Government received $63.1 million from taxes, export duties, and the benefit derived from the dual rate of exchange.[4] This represents about 32.8 percent of the total receipts of the Government for 1964—$192 million. In addition, the company placed orders with local industry and trades during the year which totaled $10.5 million.

The Union Minière probably was the largest nongovernment employer in the Congo. At the end of 1964, it employed 2,132 supervisors and 21,957 laborers; employees and their dependents totaled 102,459 persons. The supervisory staff increased 7.7 percent over the number in 1963; Africans on the staff at the end of 1964 numbered 219, 20 percent more than in 1963. The labor force was 8.7 percent greater in 1964 than in 1963; the instability of the labor force, which has stemmed directly from the country's unsettled conditions, resulted in a generally lower standard of vocational skill than in the years prior to independence. The labor replacement rate for 1964 was 21 percent, slightly improved from the 1963 rate of 27 percent.

As in the past, the company provided vocational and educational training to its employees and their dependents. The primary schools were attended by 23,284 children, nearly 14 percent more than in 1963; 812 boys and 935 girls attended vocational schools.

GOVERNMENT POLICIES AND PROGRAMS

The Congo Government continued its general policies of improving foreign trade and establishing a healthy and stable economic climate. The most significant action insofar as the mineral industry is concerned was the series of negotiations between the Governments of Belgium and the Congo relative to the transfer to the Congo of stock in the Union Minière du Haut Katanga held by the Compagnie du Katanga and partly owned by the Belgian Government. At yearend, it appeared that Compagnie du Katanga would assign to the Congo Government an additional 12,500 shares of Union Minière stock. If completed, this would give the Government 222,950 shares of Union Minière, equivalent to about 18 percent of its capital and 24.5 percent of the voting rights.

PRODUCTION

The general increase in production of most mineral commodities reflected the gradual resumption of normal operations by most of the companies. In those instances where production declined, the explanation almost invariably lies in the disruptions stemming from the rebellion.

---

[4] Union Minière du Haut Katanga. Rapport annuel, 1964, 43 pp.

TABLE 1.—Republic of the Congo (Léopoldville): Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1960	1961	1962	1963	1964
Metals:					
Beryl	335	167	277	213	223
Cadmium ... kilograms	505,000	532,000	307,000	393,000	469,000
Cobalt (recoverable)	8,222	8,326	9,683	7,376	[2] 7,676
Columbium and tantalum concentrates: [3]					
Columbium [4] ... kilograms	103,295	51,295	25,331	74,133	3,500
Tantalum [4] ... do	150,787	74,516	103,502	66,794	45,885
Copper, smelter [5]	302,252	295,200	295,236	269,924	275,547
Germanium (recoverable) ... kilograms	25,101	13,549	8,006	7,283	8,271
Gold ... troy ounces	314,145	233,672	203,707	[r] 214,574	[e] 125,741
Lead, metal	----	----	283	1,185	1,045
Manganese ore	[r] 381,627	316,240	316,197	270,033	309,700
Silver ... troy ounces	3,962,836	3,457,877	1,595,513	1,097,176	1,480,250
Tin:					
Mine ... long tons	8,636	6,314	6,875	[r] 6,883	7,677
Metal ... do	2,532	275	945	1,441	1,387
Tungsten ore and concentrate, 60 percent WO_3 basis	575	540	[r] 368	202	227
Uranium oxide, U_3O_8 [6]	[r] 1,089	----	----	----	----
Zinc:					
Mine	109,182	99,634	95,735	103,545	105,540
Refined (electrolytic)	53,358	56,960	56,027	52,724	55,553
Nonmetals:					
Cement ... thousand tons	200	140	197	246	[e] 270
Diamonds:					
Gem ... thousand carats	415	405	256	296	295
Industrial ... do	13,040	17,738	14,400	14,468	[7] 14,457
Mineral fuels: Coal, bituminous ... thousand tons	163	73	76	92	100

[e] Estimated. [r] Revised.

[1] In addition to commodities listed, The Republic of the Congo (Leopoldville) also produced simple construction materials, but only partial data on output were available.

[2] Includes 5,139 tons of granules; 2,537 tons of cathodes.

[3] Includes Rwanda and Burundi through 1963.

[4] U.S. imports.

[5] Including recoverable copper in exports of cathodes, blister copper, cobalt-copper alloy, zinc concentrates and other products.

[6] Uranium production ceased in 1960 because of exhaustion of ore.

[7] This represents registered diamond production; it is estimated that an additional 12 to 14 million carats valued at about $35 million were illegally produced and exported.

TRADE

Largely because of its mineral exports, the Congo has had a favorable trade balance for many years. Shown below are trade statistics for 1963 and 1964:

	Value (million dollars)		Minerals' share of total (percent)
	Mineral commodities	Total	
Trade balance:			
1963	+165.0	+100.2	XX
1964	NA	+96.7	XX
Exports:			
1963	213.3	307.9	69.3
1964	263.3	366.7	71.8
Change, 1963 to 1964	+50.0	+58.8	2.5
Imports:			
1963	48.3	207.7	23.3
1964	NA	270.0	NA
Change, 1963 to 1964	NA	+62.3	NA

NA Not available.
XX Not applicable.

Exported metals and metallic minerals in 1963 were valued at $182.1 million; copper, alone, was valued at $116.6 million. Tin and cobalt were the next most valuable metal exports—valued at $22.8 million and $18.2 million, respectively. Among the nonmetallic mineral exports, diamonds valued at $30.2 million were by far the principal item.

Mineral fuels, mainly petroleum products, valued at $28.5 million, accounted for more than half of the mineral imports by value. Steel rolled products, at $13.6 million, were the second most valuable group of imports.

Belgium was the principal destination for the 1963 exports, with a total of 52.1 percent of all exports; other European Economic Community countries received 21.4 percent; the United Kingdom received 10.0 percent; and the United States, 4.9 percent. These figures do not account for subsequent transshipments of Congolese

TABLE 2.—Republic of the Congo (Léopoldville): Exports of metals and minerals[1]

(Metric tons unless otherwise specified)

Commodity	1960	1963	Principal destinations, 1963
Metals:			
Aluminum scrap	NA	4	All to Belgium.
Beryl	419	129	All to United States.
Bismuth kilograms	NA	426	All to Netherlands.
Cadmium do	•508,000	390,000	Belgium 370,000.
Cobalt:			
Granules	7,362	4,388	All to Belgium.
Cathode		2,036	
Cobalt-copper alloy		965	
Columbium-tantalum:			
Ore kilograms	203,000	103,591	Tanganyika 62,000; Belgium 21,000; United States 12,000.
Slag do	819,000	310,615	All to Belgium.
Copper:			
Scrap	284,494	36	All to Belgium.
Wire bars		107,072	Belgium 161,715; France 27,445; Italy 21,124; Japan 6,327.
Cathode		61,779	
Blister		68,407	
Rolled products		34	Southern Rhodesia 19; Northern Rhodesia (Zambia) 2; Angola 2.
Germanium	[2] 187	9	All to Belgium.
Gold:			
Concentrate	NA	22	United States 21; Belgium 1.
Metal troy ounces	355,748	249,332	All to Belgium.
Manganese ore	• 304,815	221,872	NA.
Tin:			
Concentrate long tons	9,000	9,714	Belgium 8,108; Netherlands 770; United Kingdom 553.
Metal do	2,529	1,031	All to Belgium.
Tungsten concentrate	1,177	94	All to Belgium.
Zinc:			
Concentrate	97,540	66,664	Belgium 65,085.
Metal	50,803	51,641	United States 9,017; West Germany 5,564; United Kingdom 4,295.
Nonmetals:			
Cement	[2] 406	34,021	Burundi 10,715; Central African Rep. 9,290; Rep. of Congo (Brazzaville) 3,867; Chad 3,600.
Diamond thousand carats	10,356	14,414	All to United Kingdom.
Precious and semi-precious stones, other than diamond do	NA	1,820	NA.
Lithium minerals	1,500	NA	
Salt	NA	20	NA.
Mineral fuels: Coal	NA	65	All to Southern Rhodesia.

• Estimated. NA Not available.

[1] No detailed data are available for the years 1961 and 1962.

[2] January-June only.

products from Belgium to other countries; it is estimated, on the basis of U.S. Customs import data, that the true figure for Belgium is about 25 percent and that for the United States is about 14 percent. Belgium received 68.4 percent of the copper metal and 8.0 percent of the zinc metal exports; the United States received 29.9 percent of the zinc metal exports.[5]

The United States supplied 31.2 percent of all Congolese imports for 1963, and Belgium supplied 27.5 percent. Europe as a whole supplied 48.1 percent of the imports, and Africa, 15.0 percent.

TABLE 3.—Republic of the Congo (Léopoldville): Imports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1960	1963	Principal sources, 1963
Metals: [2]			
Aluminum	1,009	1,167	Belgium 340; West Germany 304; United Kingdom 154; United States 111.
Copper	95	151	Belgium 133; United Kingdom 7; West Germany 5.
Gold ... troy ounces	----------	1,929	All from Belgium.
Iron and steel:			
Pig iron	160	1,668	Rep. of South Africa 1,056; Southern Rhodesia 279; Northern Rhodesia (Zambia) 276.
Ferroalloy	271	578	Rep. of South Africa 208; Southern Rhodesia 163; Belgium 143.
Scrap	725	261	United States 246; Kenya-Uganda 15.
Oxide and powder	NA	110	West Germany 51; Belgium 43; United States 16.
Ingots, blooms, billets	64	(3)	
Rolled products:			
Rails and track material	38,644	6,575	Belgium 5,270; United Kingdom 602; Luxembourg 592.
Pipes and fittings		4,903	Belgium 2,262; Japan 935; United States 595; France 473.
Other		41,742	Belgium 18,868; United States 13,150; Southern Rhodesia 2,560; Rep. of South Africa 1,176; United Kingdom 1,013.
Lead	793	136	Belgium 109; West Germany 11; Rep. of South Africa 10.
Manganese oxide	NA	29	All from Belgium.
Mercury ... 76-pound flasks	NA	44	Belgium 36; Spain 8.
Nickel	2	45	United Kingdom 40; Rep. of South Africa 4.
Platinum ... troy ounces	32	NA	
Silver ... do	73,971	48,998	Belgium 48,901.
Tin ... long tons	13	22	Belgium 14; Southern Rhodesia 3; Northern Rhodesia (Zambia) 2.
Titanium oxide	NA	234	Belgium 122; United States 74; West Germany 25.
Zinc	50	122	Belgium 76; West Germany 21; United States 15.
Slag and other	155	195	United States 148; Belgium 44.
Nonmetals:			
Abrasives	6	3	Belgium 2; United Kingdom 1.
Asbestos:			
Crude	323	1,581	United States 901; Southern Rhodesia 428; Belgium 120.
Products	----------	96	Belgium 60; United Kingdom 30.
Barite and witherite	NA	111	West Germany 101; Belgium 10.
Brick and tile	----------	6,062	Rep. of South Africa 2,567; Southern Rhodesia 1,048; West Germany 402.
Cement	9,000	392	Angola 116; Belgium 112; Kenya-Uganda 75; France 53.
Chalk	1,338	1,388	France 944; Belgium 275; Rep. of South Africa 147.
Clays	333	859	France 232; West Germany 206; United States 157; Algeria 105.
Dolomite	73	77	Belgium 71; West Germany 4; Netherlands 2.
Feldspar	23	162	Rep. of South Africa 161.
Gypsum	6,272	5,745	France 5,500; Burundi 218.
Lime	1,210	1,536	Belgium 1,103; West Germany 400.
Limestone	813	----------	

See footnotes at end of table.

---

[5] U.S. Embassy, Léopoldville. Airgram A–49, Aug. 6, 1964.

TABLE 3.—Republic of the Congo (Léopoldville): Imports of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1963	Principal sources, 1963
Nonmetals:—Continued			
Magnesium sulfate (kieserite)	360	30	All from West Germany.
Magnesite	17	1,427	Rep. of South Africa 1,226; United States 151.
Phosphate	51	145	Rep. of South Africa 143; Belgium 2.
Quartz and quartzite	64	86	Norway 64; Rep. of South Africa 22.
Salt	31,574	28,580	Cape Verde Islands 12,059; Angola 9,134; Spain 1,865.
Sand	92	11	United Kingdom 9.
Siliceous earths	311	487	France 161; United States 153; Rep. of South Africa 150.
Sodium carbonate (natural)	2,930	2,399	Belgium 1,599; Rep. of South Africa 800.
Stone:			
Dimension	80	----------	
Fluxing	204	----------	
Paving	107	2	All from Belgium.
Sulfur	138	97	West Germany 61; Belgium 22; United States 9.
Talc	279	268	Belgium 99; United States 59; Sweden 40; United Kingdom 40.
Other [4]	----------	61	Belgium 36; Norway 10; West Germany 6.
Mineral fuels:			
Coal and briquets	97,007	175,874	Southern Rhodesia 149,057; Rep. of South Africa 13,642; Mozambique 7,366.
Coke and semicoke	38,448	43,599	Southern Rhodesia 41,383; Belgium 2,050.
Tar, mineral	117	94	Rep. of South Africa 33; Belgium 28; Trinidad 17; United Kingdom 16.
Coal tar byproducts	227	260	Belgium 172; United States 59; Rep. of South Africa 19.
Petroleum: [5]			
Crude	135	----------	
Refinery products:			
Gasoline	139,000	197,721	United States 77,179; Netherlands Antilles 43,103; Angola 16,544; Italy 12,888.
Kerosine	37,000	65,964	United States 23,485; Venezuela 18,713; Netherlands Antilles 7,418.
Distillate fuel oil	111,000	145,252	United States 52,499; Venezuela 40,179; Netherlands Antilles 16,279.
Residual fuel oil	17,000	34,230	Angola 15,856; Netherlands Antilles 9,544; Italy 7,808.
Liquid petroleum gas	1,100	1,182	Belgium 1,073.
Lubricants	12,000	28,910	United States 21,747; Belgium 3,711; Venezuela 900.
Asphalt and bitumen	7,000	4,033	Canary Islands 2,300; Belgium 1,069; United States 489.
Petroleum jelly and wax	----------	242	United States 109; Malaysia 51; Mozambique 25.
Other ..... 42-gallon barrels	17,000	----------	

NA Not available.

[1] 1960 data are exclusive of the provinces of Katanga and South Kasai for the second semester. Includes the former trusteeship area of Ruanda-Urundi through June 30, 1960. Data are not available for 1961 and 1962.

[2] Includes unwrought, scrap, and semimanufactures.

[3] Less than 0.5 unit.

[4] Includes the following (in tons): Graphite 5, mica 13, carbon black 7, and meerschaum 0.8.

[5] 1960 quantities are converted from 42-gallon barrels to metric tons by dividing by the following factors: Crude oil—7.4, gasoline—8.6, kerosine—7.7, distillate fuel oil—7.5, residual fuel oil—6.5, liquid petroleum gas—11.8, asphalt and bitumen—6.1, and lubricants—7.0.

COMMODITY REVIEW

METALS

Cadmium.—The Société Métallurgique Katangaise (Métalkat) processed at its Kolwezi plant the cadmium- and germanium-bearing cements formed in treating the flue dusts from the Lubumbashi smelter and from the acid plants of Société Générale Industrielle et Chimique du Katanga (Sogechim); it processed 4,916 tons of dusts from Lubumbashi and 287 tons from the acid plants.

Cobalt.—The Congo (Léopoldville) continued to be the chief source of the free world's supply of cobalt. Output was entirely as a byproduct of copper production. The Union Minière du Haut-Katanga, the country's only producer, supplied 60 percent of free world cobalt in 1964. Output consisted of 5,139 tons of electrolytic granules and 2,537 tons of cobalt cathodes.

The Shituru plant, Jadotville, produced 4,768 tons of cobalt cathodes; part of these and some from the Luilu plant were refined to produce 4,963 tons of granules. The electrolysis plant at Luilu produced 3,676 tons of cathodes, including those refined at Jadotville.

Columbium-Tantalum.—Production data on columbium and tantalum are incomplete, because the producing areas were occupied by rebel forces during most of the latter half of 1964. Bureau of Statistics estimates for the year were 7,000 tons of cassiterite ore containing about 7 percent of columbium-tantalum pentoxide. The Compagnie Géologique et Minière des Ingénieurs et Industriels Belges (GEOMINES), the largest producer of these metals, reported production of 100 tons of colombium-tantalum concentrates for the fiscal year ended June 30, 1964.[6]

Copper.[7]—The Union Minière du Haut-Katanga remained the sole producer of copper in the Congo; its production included 212,149 tons of electrolytic ingots and 63,398 tons of blister and other forms.

Production of ores from the individual mines was as follows (in tons):

Kamoto	1, 240, 311
Ruwe	665, 516
Musonoi	2, 242, 410
Kingamyambo	109, 578
Kambove West	674, 036
Kakanda	607, 658
Kipushi (includes zinc ore)	1, 035, 049
Total	6, 574, 558

The Kingamyambo open-pit mine was closed down in 1964. The Kolwezi and Ruashi mines were closed in 1963. At the Kipushi mine, discovery of new ore reserves at the deep levels caused a revision of mining schedules for the coming year. Output of the Kambove underground mine was somewhat curtailed pending completion and equipment of the main shaft. In addition to the ore extracted by the copper-cobalt and copper-zinc mines, a total of 11 million cubic meters of overburden were excavated.

Total ore processed by the beneficiation plants, including that withdrawn from stockpiles, was 7,769,887 tons. Data for the individual plants follows:

---

[6] Cie. Géologique et Minière des Ingénieurs et Industriels Belges. Rapports présentés à l'assemblée générale des actionnaires du 16 fevrier 1965, Exercise 1963–64.

[7] Union Minière du Haut-Katanga. Rapports présentés à l'Assemblée générale annuelle du 28 mai 1965.

Concentrator	Tonnage treated	Concentrates produced			
		Tons	Grades (percent)		
			Cu	Co	Zn
Kolwezi	3,992,463	641,060	25.28	1.29	----------
Kipushi	1,033,637	186,395	27.56	----------	----------
		178,882	----------	----------	59.00
Kambove	860,995	138,179	27.21	1.66	----------
Kambove (washer)	146,326	[1] 92,250	6.69	----------	----------
Kakanda	632,605	78,373	23.70	.82	----------
Ruwe (washer)	[2] 1,103,861	34,748	24.63	----------	----------
		[1] 245,466	6.92	----------	----------

[1] Products retreated in concentrator.
[2] Includes 464,811 tons of intermediate products from stock.

The Lubumbashi smelter at Elizabethville produced 93,907 tons of copper matte, chiefly from the Kipushi sulfide concentrates; this matte was converted to yield 59,595 tons of blister copper. Crude copper totaling 9,221 tons was produced from Kambove mine dolomitic concentrates. The Lubumashi smelter also recovered 2,908 tons of cadmium- and germanium-bearing flue-dust.

The Shituru plant at Jadotville produced 111,930 tons of copper cathodes and 10,766 tons of starting sheets. Treating products from other plants, it produced an additional 142,151 tons of electrolytic-grade copper and 25,895 tons of anodes for starting sheets.

The Luilu plant at Kolwezi produced 101,701 tons of copper cathodes and 8,986 tons of starting sheets.

Germanium.—Flue-dusts from the Lubumbashi smelter processed in 1964 amounted to 4,916 tons; these, with 287 tons of dust from the sulfuric acid plants, yielded concentrates containing 8,271 kilograms of recoverable germanium.

Gold.—Operations of the gold producing companies in the eastern and northeastern parts of the Congo were directly affected by the rebellion in that area during the last half of 1964. Large numbers of skilled mineworkers, as well as European supervisors, were slain and mining operations were virtually stopped. The loss of personnel will probably be felt for many years. One of the mining companies, Compagnie Miniére des Grands Lacs (MGL), took an active part in supporting the legal government by providing trucks and drivers, food, housing, and weapons; its production at the Kamituga mine was never stopped and in 1964 was maintained at 80 percent of capacity.[8]

Because of these disorders, precise production data are not available. To the end of July 1964, Kilo-Moto produced 116,193 troy ounces of gold; from this time to the end of November, 48,200 ounces were produced but were seized by the rebels.[9]

Lead.—The Union Minière produced a small quantity of lead at its Jadotville electric smelter for the company's own use.

---

[8] U.S. Consulate, Bukavu. Airgram A-2. July 12, 1965, p. 11.
[9] Mining Annual Review (London). May 1965, p. 193.

Manganese.—The Société Minière de Kisenge (formerly Bécéka Manganese Company) announced at yearend the formation of a new venture for the manufacture of dry cell batteries using primary materials of local origin. The plant of the new company, Société Afripile, will be located at Kisenge and when completed should have an annual capacity of 20 million batteries of all sizes.[10]

Tin.—Congolese tin production came mainly from the eastern part of the country and, in 1964, suffered from the disruptions accompanying the rebellion in this area. Although most of the cassiterite mines were for a time in the hands of the rebels, little damage was done to the installations themselves; greatest losses were in trucks and other vehicles—only 5 percent of those operating the previous year were in service after the rebellion.[11]

In spite of these difficulties, tin content of the concentrates produced was 18 percent above the production for 1963. The International Tin Council reported that Syndicat Minière d'Étain (Symétain) produced 3,350 long tons of concentrates and that Géomines produced ore having a metal content of 1,464 long tons.[12]

Zinc.—The Kipushi (Prince Léopold) mine of Union Minière continued as the sole producer of zinc ore. This mine produced a total of 1,035,049 tons of copper and zinc ores during 1964; 178,882 tons were zinc concentrates averaging 59 percent zinc. The Société Générale Industrielle et Chimique du Katanga (Sogechim), a Union Minière subsidiary, processed 121,935 tons of Kipushi concentrates which yielded 107,271 tons of sulfuric acid and 101,942 tons of roasted concentrates. The Société Métallurgique Katangaise (Métalkat) treated 96,482 tons of roasted concentrates to produce 55,553 tons of electrolytic zinc. Exports of crude and roasted concentrates were 77,092 tons.

NONMETALS

Cement.—The Société des Ciments Métallurgiques de Jadotville, a subsidiary of the Union Minière, sold 12,885 tons of cement in 1964 as compared with 9,000 tons in 1963. The plant of Société des Ciments du Kivu remained idle during 1964.

Diamond.—Illicit diamond production and marketing continued to plague the Congo. The loss in revenue to the Government caused strong measures to be taken early in the year against these activities; the onset of civil disorders in late spring largely nullified these measures, and the illicit activities increased. Banking sources in the Congo estimated that, in addition to the 14.8 million carats registered with the Government, between 12 and 14 million carats worth approximately $35 million were illegally produced and exported.

The Société Minière de Bakwanga (Miba) maintained its position as the chief producer of Congo diamonds, accounting for practically all of the registered diamonds. The company began construction during the year of a new hydroelectric power station on the Lubilash river. With the financial assistance of its parent company, Société d'Entreprise et d'Investissements du Bécéka (Sibéka), it also designed and manufactured an electronic diamond sorter which is scheduled to be in service about the end of 1965. The company began contributing on a larger scale to the economic and social development of the area in which it operated; these contributions included road repairs and maintenance, providing basic foodstuffs at reduced prices to its employees, and reconstruction of the town of Mbujimayi.[13]

---

[10] U.S. Consulate, Elizabethville. Airgram A-123. Jan. 6, 1965.
[11] U.S. Consulate, Bukavu. Airgram A-2. July 12, 1965, p. 11.
[12] Tin International (London). Statistical Supplement. March 1965.

Stone.—The Union Minière produced for its own use as metallurgical flux 179,630 tons of limestone from its Kakontwe quarry. For railroad ballast and building purposes, it also produced 113,732 tons of crushed stone and 22,438 tons of sand from the small Katonto quarry.

MINERAL FUELS

Coal.—The Charbonnages de la Luena produced 100,190 tons of coal from its Kaluku workings.

Petroleum.—In February 1964, shows of oil and gas were found about 25 kilometers north of Moanda, near the border of the Cabinda enclave, in a well drilled by Société Congolaise de Recherches et d'Exploitation Pétrolières (Socorep), a joint venture of Belgian companies with Petrofina as operator. The well, Lindu No. 1, was drilled to a total depth of 6,233 feet (1,900 meters) and flowed oil on drillstem tests of a zone at about 6,180 feet; the oil was 30.4° API.[14] Evaluation of the discovery was continuing at yearend.

The refinery being built by the Congo Government and the Italian firm, Ente Nazionale Idrocarburi (ENI), at Kinlao, near Moanda, near the mouth of the Congo river, was expected to go on stream in late 1965.

SOURCE MATERIALS

In addition to official statistical publications of the Government of the Republic of the Congo (Léopoldville), many company reports were used to obtain data and background information. The dispatches of the U.S. Embassy, Léopoldville, and the various U.S. Consulates in the Congo provided both statistical and historical data.

---

[13] Société Générale de Belgique. Report 1964. p. 105.

[14] Saint, R. Petroleum Developments in Central and Southern Africa in 1964, Republic of the Congo. A.A.P.G. Bull. v. 49, No. 8, August 1965, p. 1266.

The Mineral Industry of Ethiopia

By E. Shekarchi[1]

◆

MINING and mineral production continued to be of minor importance to both the Ethiopian economy and world mineral production in 1964. Although production statistics are no longer released by the Ethiopian Government, the value of mineral output constituted less than 1 percent of the gross national product (GNP). The most significant mineral development in 1964 was the completion of the Yugoslav-built cement factory in Addis Ababa.

Petroleum products and semimanufactures of iron and steel were Ethiopia's principal mineral commodity imports, petroleum products constituting 50 percent of such imports and iron and steel products about 31 percent.

More than 90 percent of the population was engaged in farming or livestock raising. Total GNP was increased from an estimated $935 million in 1963 to about $982 million in 1964, or 5 percent.[2] Agriculture accounted for 70 to 75 percent and industry (including mineral production and processing) for 5 to 15 percent. Per capital income was $46 during 1964.

The labor movement made progress and the Confederation of Ethiopian Labor Unions, with which all unions are affiliated, became a member of the International Confederation of Free Trade Unions (ICFTU) in 1963.

GOVERNMENT POLICIES AND PROGRAMS

The Government continued its efforts to encourage private foreign and domestic investment. Measures toward this end included division of the State Bank of Ethiopia into the National Bank and the Commercial Bank, implementation of the investment decree of 1963, and the establishment of an investment promotion department in the Development Bank of Ethiopia.

The Ministry of Commerce and Industry announced that a new factory would be completed within 18 months for the production of galvanized steel sheets.

Local economic development was being encouraged by providing highway services to isolated areas having exceptional potentialities for agricultural, mineral, and commercial development. The road system of Ethiopia consisted of 22,550 kilometers of improved and unimproved roads at yearend. Improvements have been made on approximately 5,500 kilometers of all-weather roads, of which 1,270 kilometers are asphalt surfaced.

---

[1] Foreign mineral specialist, Division of International Activities.

[2] Where necessary, values have been converted from Ethiopian dollars (Eth$) to U.S. dollars at the rate of Eth$1=US$0.4032.

Agreement was reached between the Ethiopian Government and the French Government for construction of a railway link between Nazareth and Dilla, a distance of 315 kilometers. Financing will be made under a French credit loan amounting to $11 million. Construction is expected to take 4 years.

The International Bank for Reconstruction and Development (IBRD) loaned $13.5 million for the foreign exchange cost of the third program, and the U.S. Agency for International Development (AID) made a loan for $4 million to cover the Lekemti-Gimbi (110 kilometers) and Agaro-Bedelle (103 kilometers) sectors of the road building program.

An agreement for a feasibility study of a hydroelectric project on the Fincha River in Western Ethiopia, costing about $504,000 and financed by AID, was signed by the Ministry of Public Works and Harza Engineering Co. of Chicago, Ill. The project envisaged will have an 80,000-kilowatt capacity by 1971.

Import duties were amended in November 1964 with an average increase of 5 to 10 percent on a number of commodities including iron and steel sheeting and plates, and motor vehicles.

PRODUCTION

Official data on mineral production in 1964 are available only for nonmetallic minerals produced in the country and amounting to $3.8 million. Estimates based on forecasts for output of gold, manganese, and platinum, the principal commodities produced in the country, indicate a decline from the 1960 production level and a leveling off for the last 3 years. Durng 1964 cement, lime, and salt production increased 29 percent, 35 percent, and 2 percent, respectively, and at yearend prospects were excellent for increased mineral production of both metals and nonmetals.

TABLE 1.—Ethiopia: Production of metals and minerals[1]

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Gold troy ounces	46,059	[e] 47,029	28,015	[e] 27,300	[e] 27,300
Manganese ore (shipments)	9,255	7,000	6,000	[2] 3,496	[2] 3,248
Platinum, placer troy ounces	189	180	180	[e] 180	[e] 180
Nonmetals:					
Cement thousand metric tons	28	30	41	34	[e] 44
Feldspar	1,000	3,000	432	[e] 500	[e] [r] 1,000
Kaolin thousand metric tons	2	4	1	NA	NA
Lime [3]	2,507	4,538	5,488	4,408	[e] 6,000
Salt [3] thousand metric tons	157	151	198	255	[e] 263

[e] Estimate. [r] Revised. NA Not available.

[1] Including Eritrea.

[2] U.S. imports.

[3] Data are for years ending September 10.

TRADE

The trade position of Ethiopia improved in 1963 over that of 1962. Final customs figures for the year showed total exports of $105.5 million and total imports of $123 million. Recorded exports of minerals and metals were insignificant, while the value of imports of petroleum products of about $10.04 million and of metals and semimanufactures of about $11 million constituted approximately 17 percent of the total imports. Complete detailed figures and information were not available for imports and exports in 1963; therefore, principal destinations, as well as breakdown on each category, are omitted from the trade tables.

TABLE 2.—Ethiopia: Exports of metals and minerals

(Metric tons)

Commodity	1962	1963	Principal destinations, 1962
Metals:			
Scrap, ferrous	NA	100	
Manganese ore	[1] 6,292	NA	
Nonmetals:			
Clays	6	NA	Saudi Arabia 4; Sudan 2.
Fertilizers	20	NA	All to Italy.
Marble	20	NA	All to Sudan.
Salt	121,923	58,194	Japan 94,266; France 10,441; Kenya 9,751; Malaya 5,000.

NA Not available.
[1] U.S. imports only.

TABLE 3.—Ethiopia: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Commodity	1962	1963
Metals:			Nonmetals—Continued		
Aluminum	206	231	Salt	365	NA
Copper and alloys	19	NA	Stone, building	13	NA
Iron and steel:			Sulfur	67	NA
Pig iron, scrap and ingots	26	NA	Other	593	NA
			Mineral fuels:		
Manufactured	16,331	22,007	Coal and coke	24	9,235
Lead	2	NA	Coal byproducts	56	NA
Nickel	80	NA	Petroleum refinery products:		
Silver and platinum--troy ounces	292,315	NA	Gasoline	64,148	88,633
Tin--long tons	336	NA	Kerosine	2,347	4,994
Zinc	35	NA	Distillate fuel oil	41,081	2,040
Other metals	91	NA	Residual fuel oil	1,956	NA
Ore, unspecified	15	NA	Lubricants	[1] 28,590	3,925
Nonmetals:					
Abrasives, natural	6	NA	Liquefied petroleum gas	340	NA
Cement	9,627	39,125	Asphalt	3,577	6,484
Fertilizer:			Other	8,599	2,206
Crude	101	NA			
Other	394	NA	Total	150,638	NA

NA Not available.
[1] Believed to consist mainly of residual fuel oil erroneously included.

COMMODITY REVIEW

METALS

Copper.—Ethiopian geologists discovered a promising copper vein on Mount Saccar, off the Asmara-Massawa road about 50 kilometers from Asmara. The Yugoslav firm, Rudis, has been awarded a contract for 2,000 meters of exploratory drilling in this area.

Iron and Steel.—The ministry of Commerce and Industry announced that a new factory would be completed within 18 months near Addis Ababa for the production of galvanized sheets. The factory will be owned and operated by the Ethiopian Galvanized Industries Ltd. and reportedly will produce 12,000 galvanized sheets of an unspecified size per year during the initial stage. This is a private company with shares held by Japanese companies and Ethiopian private shareholders.

Manganese.—The Tigre Mining Concession manganese mine at Enkafala, approximately 20 kilometers southwest of Dallol, continued operations during 1964 at the same rate as that of 1963. No new exploration activities were reported and predicted reserves of 75,000 metric tons of 51 percent manganese dioxide content remained unchanged.

NONMETALS

Cement.—Progress continued in the cement industry. The factory under construction near Addis Ababa was completed and reportedly has an annual production capacity of 70,000 metric tons of cement. The cement plant at Dire Dawa was producing about 30,000 tons annually during 1964. A subsidiary of Friedrick Krupp of Rheinhausen, West Germany, started construction of a 70,000-ton capacity cement plant in Massawa. Completion of this plant will permit production in excess of internal needs, thereby providing the possibility for export.

Potash.—Exploration and development of the potash deposit near Dallol, in the northern part of the Danakill Depression inland from the Red Sea, continued during 1964. The potash deposit is part of the concession for which the Ralph M. Parsons Co. of the United States holds all mineral and exploitation rights except for oil and other hydrocarbons. Originally, development work was expected to lead to production of 300,000 metric tons per year of exportable material containing 25 percent potassium oxide. However, development plans were delayed because more work was necessary on a newly found extension of the orebody.

MINERAL FUELS

Petroleum.—Three petroleum companies were active in Ethiopia during 1964. Gewerkschaft Elwerath of Hanover, West Germany, performed no additional geophysical investigations during the year but in November spudded a wildcat in its Oria concession area, formerly held by Sinclair Oil Co., near the Somali border. This well, Bokh No. I was drilling at 1,081 feet at yearend. Elwerath abandoned its Abred No. I in the latter part of 1963.

Under the agreement signed between the Ethiopian Government and Mobil Petroleum Co., Inc., in February 1963 for exploration of crude oil, natural gas, and associated hydrocarbons, Mobil Petroleum Ethiopia, Inc., continued its 1963 gas-exploder marine seismic survey into 1964. A shallow water marine seismic survey was initiated early in the year and a land seismic survey later in the year. Geological field studies extended throughout 1964.

On the basis of the petroleum agreement signed between the Ethiopian Government and Gulf Oil Co. of Ethiopia, a subsidiary of Gulf Oil Corp., some reconnaissance surface geological work was performed along the Red Sea coast and a marine seismic survey was conducted on the offshore islands south of Massawa.

Work started on the oil refinery at Assab which is being financed under a credit from the U.S.S.R. It is expected that the $12 million refinery, which will have a throughput capacity of 500,000 tons, will be completed in about 2 years.

In connection with the refinery, it was announced in August 1964 that the Soviet firm of Iyazhprom Export will construct a 13,500-kilowatt thermoelectric plant in Assab to supply steam and power for the refinery. Cost of construction of the plant is estimated at $3.3 million, of which $2.6 million would be financed under the Soviet credit of $100 million.

Electric Power.—Further expansion of the power capacity will be possible upon completion of two additional dams on the Awash River downstream from the existing dam at Koka. A loan agreement was signed in 1964 between the Ethiopian Government and IBRD which provides for $23.5 million for this project. The French firm CITRA has been selected as the contractor for the construction of the dams, and the consulting engineers will be Lahneyer Associated.

Società Electrica Dell' Africa Orientale (SEDAO) opened a new power station at Belesa (12.8 kilometers north of Asmara). The new station's installed capacity of 5,000 kilowatts brings the total installed capacity of SEDAO to 14,410 kilowatts. An additional generating unit rated at 10,000 kilowatts will be installed late in 1965 at Belesa.

SOURCE MATERIALS

The source material for this section consists chiefly of dispatches from the U.S. Embassy in Addis Ababa. The dispatches furnished accounts of the principal events in 1964, including information on production. Data on trade and other subjects are mainly from mining and geological literature and publications of the Imperial Ethiopian Government.

The Mineral Industry of Gabon

By James A. West[1]

⁂

THE mineral industry of the Republic of Gabon continued in 1964 the spectacular advances of recent years; it became Gabon's most important industrial activity and the source of nearly one-half of its foreign exchange earnings. Production of manganese ore, which began in 1962, accounted for almost 6.3 percent of estimated 1964 world output and ranked Gabon as the sixth largest producer in the world. In addition to manganese ore, Gabon produced crude petroleum, uranium concentrate, gold, and simple building materials. Substantial progress was made in studies for the exploitation and economic development of the large high-grade iron deposits in the Mekambo district of northeast Gabon.

The estimated value of all minerals produced, excluding building materials, was $46.9 million, 40 percent over the 1963 figure. Mineral exports during 1964, valued at an estimated $40.7 million, were essentially equal to that of timber, the country's only other significant commodity export.

GOVERNMENT POLICIES AND PROGRAMS

The Government made substantial progress in programs to advance the economic development of the country as set forth in its interim 3-year plan covering 1963–65. It actively encouraged plans for development of the Mekambo iron ore deposits, construction of a cement plant, and an oil refinery, and other mineral industry projects. The Planning Commission conducted important economic and industrial studies as a basis for a comprehensive 5-year national economic development plan to be placed in operation by 1966. The investment code continued to encourage foreign private industry participation in industrial and commercial activities.

PRODUCTION

Except for a slight decline in uranium concentrate production, Gabon's principal mineral extractive industries recorded outstanding gains in output in 1964. Compared with the 1963 figures, manganese ore output was up 49 percent, and crude oil, natural gas, and gold production increased by 19, 9.9, and 19.7 percent, respectively. Production data on minor building materials are not recorded; however, domestic requirements for materials other than lime and cement were met by local producers.

---

[1] Chief specialist, Near East and South Asia, Division of International Activities.

TABLE 1.—Gabon: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1960	1961	1962	1963	1964
Metals:					
Gold troy ounces	17,683	15,304	16,300	35,719	r 42,750
Manganese ore			203,244	r 636,587	948,303
Uranium concentrate		969	1,161	1,317	1,287
Mineral fuels:					
Natural gas, marketed million cubic feet	278	249	328	321	353
Petroleum, crude thousand 42-gallon barrels	5,626	5,446	5,992	6,446	7,668

r Revised.

[1] Construction materials such as clays, sand, and gravel are also produced, but no quantitative data are available.

TRADE

Trade statistics presented are for selected commodities as summarized in available monthly statistical bulletins published by the Government of Gabon and the Chamber of Commerce.

In 1963, the value of all metal and mineral exports was an estimated $32.5 million, or 44.2 percent of the total value of all exports. Manganese ore exports in 1963 were more than 11 times greater than the quantity exported in 1962 and accounted for about 42 percent of the value of all mineral exports. The only other significant minerals exported were crude oil, uranium concentrates, and gold which were valued at $10.6 million, $7.1 million, and $1.1 million, respectively.

All imports in 1963 were valued at $48.5 million, metals and minerals accounted for about $6.8 million, or 14 percent of the total. The value of 1963 imports by categories was metals, $3.5 million; nonmetals, $0.7 million; and mineral fuels, $2.6 million. Mineral imports during 1963 increased by nearly 13 percent in value over those of 1962.

TABLE 2.—Gabon: Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:		
Gold troy ounces	13,146	34,551
Manganese ore	54,532	603,673
Uranium concentrate	1,263	1,248
Mineral fuels: Petroleum, crude thousand 42-gallon barrels	5,924	6,341

Source: Republic of Gabon, Bulletin Mensuel de Statistique.

France continued as the principal trading partner of Gabon, taking 51 percent of all exports and supplying nearly 60 percent of all imports in 1963. Except for manganese ore, France was the destination of essentially all metals exported. The United States received about 69 percent of Gabon's manganese ore exports. Nearly three-fourths of all crude petroleum was exported to France. France supplied most of Gabon's metal and nonmetal imports, while the

Netherland Antilles and Venezuela supplied most petroleum refinery products.

TABLE 3.—Gabon: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:		
Iron and steel:		
Unwrought, pig iron and scrap	2	3,654
Semimanufactures	9,713	8,542
Nonmetals:		
Cement	35,322	32,056
Fertilizers, all types	72	39
Salt	967	1,502
Mineral fuels:		
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	93	114
Kerosine do	25	30
Distillate fuel oil do	185	240
Lubricants do	17	23
Other do	13	13

Source: Republic of Gabon, Bulletin Mensuel de Statistique.

COMMODITY REVIEW

METALS

Gold.—The Société Gabonaise de Recherches et d'Exploitation Miniéres (SOGREM), a Government-owned company, continued to exercise complete control over Gabon's low-grade alluvial gold deposits. These deposits, worked by villagers using primitive hand methods, occur along streambeds in scattered areas throughout the country. All gold produced was purchased by the Government for $25.39 per ounce. Most 1964 production was from the districts of M'Bigou, Koula-Moutou N'Djole, and Lastourville in the southern part of Gabon.

Iron Ore.—Iron ore deposits at Belinga in the Mekambo region of northeastern Gabon are among the world's largest known high-grade deposits. Reserves of 1 billion tons of ore having an iron content of 60 to 65 percent were reported by the Gabonese Chamber of Commerce.

The Société des Mines de Fer de Mekambo (SOMIFER), a consortium of United States and European Common Market steel companies in which Bethlehem Steel Corp. had a 50-percent interest, held a concession for exploitation of the Mekambo deposits. The deposits are in a remote area about 700 kilometers from the coast, and commercial exploitation of the deposit is contingent upon the technical and economic feasibility of developing necessary transportation and port facilities. Studies concerning the economic development of the deposit were continued by the Gabonese Government with technical and financial assistance from the United Nations Special Fund, the Common Market Development Fund, and the World Bank. Foley Brothers Inc., of New York was reported to have nearly completed a study for construction of a railroad from Mekambo to a proposed mineral export Port at Owendo, near Libreville. The studies envisage the construction of a 570-kilometer single-track railroad capable of carrying

10 million tons of iron ore, 1 million tons of timber, and 50,000 tons of agricultural and other products per year.

Manganese Ore.—Manganese ore mining continued to be Gabon's most important mineral industry. In 1964, manganese ore production was valued at nearly $21.4 million, or almost 46 percent of all minerals produced.

All ore was produced from the Moanda mine of Compagnie Minière de l'Ogooúe (COMILOG), in which the United States Steel Corp. had a 49-percent interest. At Moanda, manganiferous ore occurs on five small plateaus in ore bodies 12 to 18 feet thick at depths ranging from the surface to 30 feet. For the entire region, proved, probable, and possible reserves of 150 million, 283 million, and 167 million tons, respectively, of ore having an average of 50 percent manganese were indicated. The ore was mined by opencast methods, and the milling procedure consisted of a simple washing and screening operation.

In July 1963, a concentration plant, designed to process 800 to 1,000 tons per month of battery-grade ore, was completed. Ore, containing about 76 percent manganese dioxide, was processed by crushing and washing to produce a concentrate containing 83 percent manganese dioxide (55 percent manganese). This plant operated at about 50 percent capacity during 1964.

Ore was transported on a unique 76-kilometer aerial tramway from the mines to a railhead at M'binda in the Congo (Brazzaville), where ore trains carry it 485 kilometers to the seaport of Pointe-Noire for export. Under optimum conditions, up to 1.3 million tons of ore may be exported annually. In 1964, ore was delivered to Pointe-Noire at an f.o.b. cost of about $10 per ton.

Uranium.—In 1964, uranium concentrate continued to be produced solely from the Mounana mine of Compagnie des Mines d'Uranium de Franceville (CMUF), a corporation owned by the French Atomic Energy Commission and several French mining and banking firms.

The Mounana deposit consists of a vanadate of uranium, situated in Precambrian sediments, extending from near the surface to a depth of 30 to 40 meters. Below the surface ore is a sedimentary layer of uranium and vanadium oxides that extend to a depth of 140 meters. The deposit contains an estimated reserve of 25 million tons of ore containing about 5,000 tons of uranium metal.

The French Atomic Energy Commission, which held a research permit covering 69,000 square kilometers of the Boué-Franceville-Okondja region, continued exploration activities to determine whether the Mounana deposit was part of a uraniferous zone.

NONMETALS

Cement.—As a result of studies completed in 1964, the Société Ciments Portland Gabonais (a company owned 80 percent by the Government) planned to construct a plant with an annual capacity of 90,000 tons instead of 40,000 tons as originally planned. Construction of the plant at a site near Owenda was expected to begin in 1965.

MINERAL FUELS

Petroleum and Natural Gas.—Crude oil production from Gabon's limited petroleum resources continued as one of the most significant mineral activities of the country in 1964. All crude oil produced was exported, and these exports, valued at an estimated $12.5 million, accounted for almost one-third of the value of all 1964 mineral exports.

Gabon's proved petroleum reserves were estimated[2] as 170 million barrels as of December 31, 1964. Most reserves occur in small, low-productivity reservoirs in highly faulted sandstone formations at depths ranging from 2,000 to 8,500 feet. Commercial exploitation has been limited to 10 small onshore fields and 2 offshore fields located along the Atlantic coast in the vicinity of Port Gentil.

The Société des Pétroles d'Afrique (SPAFE) held oil exploitation rights, wholly or jointly, on offshore and onshore concession areas totaling about 106,000 square kilometers. Essentially all of Gabon's record 1964 production was from fields operated solely by SPAFE. Increased production during 1964 was largely the result of placing the six or seven existing wells of the new offshore Anguille field on prolonged production tests to determine their characteristics before proceeding with further commercial development. SPAFE continued exploration activities, drilled additional development wells in the Pointe Clairette and Cap Lopez fields, and reconditioned several wells. At midyear, 98 wells were connected to production facilities.

Affiliates of Socony Mobil Oil Co. and Royal Dutch/Shell continued exploration drilling in certain permit areas held jointly with SPAFE. Shell's affiliate, Compagnie Shell de Recherches et d'Exploitation au Gabon (COSREG) discovered oil in commercial quantities at Gamba, south of Sette-Cama. A well was completed as a producer at Gamba in September 1964, although several wells drilled in the area previously proved to be noncommercial. The Mobil affiliate, Mobil Exploration Equatorial Africa (MEEA) suspended drilling activity in its three offshore concession areas during the year. The several wells drilled in the areas have all proved nonproductive.

SPAFE continued to supply natural gas to the Société d'Énergie Électrique de Port Gentil, where it was utilized to generate electric power for the Port Gentil area.

In February, 1964, the member states of the Union Douanière Équatoriale (Gabon, Congo-Brazzaville, Central Africa Republic, and Chad) and the Cameroon Government agreed to construct an oil refinery at Port Gentil. Plans were announced for a 700,000-ton-per-year refinery to service the five countries. Negotiations were conducted with the Bureau des Recherches Pétroliéres and Compagnie Francaise des Pétroles regarding the participation of these French interests in the project.

---

[2] Oil and Gas Journal. V. 62, No. 52, Dec. 28, 1964, p. 106.

The Mineral Industry of Ghana

By William C. Henkes[1] and Eric Ho[2]

❖

DIAMOND, manganese ore, gold, and bauxite were again Ghana's major mineral products in 1964 and remained the only minerals produced by the country in quantities of world importance. The country generally retained its ranking among world producers of these commodities and supplied the following shares of estimated world production:

Commodity:	*Ghana's rank as a world producer*	*Share of world output (percent)*
Diamond	5	7.4
Manganese ore	7	3.1
Gold	6	1.9
Bauxite	18	.7

Mineral production in 1964, excluding petroleum refinery products, was valued at approximately $63.1 million, 4.0 percent of the gross national product of $1,560 million.[3]

Exports of these four mineral commodities for the first 7 months of 1964 were valued at $36.5 million, an increase of 21 percent over the value of these exports for the same period of 1963.[4]

Recorded employment by the mineral industry totaled 27,514, including 25,404 persons employed by mining companies and 2,110 persons employed in mining by contractors. Of the direct employees, 19,297 were engaged in gold mining, 3,614 in diamond mining, 2,033 in manganese mining, and 460 in bauxite mining. Gold mining employed 1,058 of the contractors' employees, and diamond mining used the remaining 1,052 workers. Data were not available for employment by salt producers, construction materials quarries, and the petroleum refinery.

GOVERNMENT POLICIES AND PROGRAMS

A 7-year development plan for the fiscal years 1963–64 through 1969–70 was presented to Parliament by President Nkrumah on March

---

[1] Petroleum engineer, Division of International Activities.

[2] Public affairs fellow, Brookings Institution.

[3] Agency for International Development. Economic Data Book, Africa, Ghana. April 1965, p. 5.

[4] Where necessary, monetary conversions have been made at the rate of G£=US$2.80.

11, 1964. The plan detailed expenditures over this period of about $2,845 million, of which the private investment sector was expected to provide $1,512 million. While reiterating his Government's policy of building a socialist society, the President emphasized that foreign investors would be welcome as partners in the development of the country. The plan, as applied to industry, will emphasize initially the production of consumer goods in order to save foreign exchange. The traditional raw material exports, minerals and agricultural and forestry products, will be processed more completely before being exported. The goal of the plan is to develop a basic industry, complete with metals, chemicals, and fertilizers, which will form a foundation for the next development plan.

Ghana continued its policy of fostering a mixed economy of private and Government enterprise. At the end of 1964, the country had 44 Government corporations. Included in the mineral industry were ones producing, processing, or marketing brick and tile, marble, diamond, gold, steel, sheet metal, and other metal manufactures.

In November, formal ceremonies marked the start of the last stage of construction of the Atomic Research Center at Kwabenya, near Accra. The project, being built with Soviet assistance, was expected to be completed in 1966. The President, in his dedication speech, stressed that the Center would be used solely for peaceful purposes; some uses which he mentioned were development of nuclear explosives for excavation, mining, and recovery of oil and gas.

PRODUCTION

Except for the 14 percent increase in manganese ore production, reported Ghanaian output of metals in 1964 declined to levels more nearly equal to those of 1962 than to the higher levels of 1963. Diamond output fell only slightly, while production of salt and petroleum products increased sharply, the latter primarily because 1964 was the first full year of operation of the Tema refinery.

TABLE 1.—Ghana: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Bauxite	193,800	203,900	243,332	314,359	250,386
Gold troy ounces	893,113	852,619	888,038	921,255	864,917
Manganese ore	553,600	438,400	379,442	407,400	462,067
Silver (exports) troy ounces	14,160	7,027	4,443	4,827	NA
Nonmetals:					
Diamond thousand carats	3,273	2,214	3,208	2,678	[p] 2,668
Salt thousand tons	12	18	19	[e] 20	31
Mineral fuels:					
Petroleum refinery products:					
Gasoline	---	---	---	35,303	154,465
Kerosine	---	---	---	24,121	50,333
Distillate fuel oil	---	---	---	65,833	268,032
Residual fuel oil	---	---	---	62,023	263,444
Miscellaneous	---	---	---	28,685	1,437

[e] Estimate. [p] Preliminary. NA Not available

TRADE

Ghana has had an unfavorable visible balance of trade since 1959, and the $66 million trade deficit for 1963, the latest year for which complete data are available, was the second largest since independence (in 1961 the deficit was $77.5 million). Total imports for 1963 were valued at $365.2 million (G£ 130.4 million), and exports of domestic products were valued at $299.2 million (G£ 106.9 million).

Despite the country's unfavorable overall trade balance, the balance of trade in minerals continued to be favorable; value of the recorded mineral exports in 1963 was $54 million, and the value of imports of minerals, metals, and mineral fuels was $50.7 million. Mineral exports amounted to 18 percent of total exports, and imports of these commodities accounted for 13.9 percent of total imports.

Of the mineral exports, gold represented 59 percent, manganese 21 percent, and diamonds 17 percent. Value of recorded diamond exports declined 54 percent from that of the previous year as a result of both reduced production and increased illegal trade.

The United Kingdom was the chief destination of Ghana's mineral exports in 1963, receiving nearly 66 percent by value of such exports, $35.5 million worth. The United Kingdom received all of the gold and silver exports, most of the bauxite, and nearly a third of the diamond exports. This country was also Ghana's best customer for overall exports, receiving 35.5 percent of the 1963 total.

Manganese was the single important mineral export to the United States. More than 100,000 tons of this commodity, valued at $3.3 million, went to the United States. Total U.S. imports from Ghana amounted to $47.4 million, 15.5 percent of the total exports.

TABLE 2.—Ghana: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Bauxite	291,401	210,754	United Kingdom 180,892; Netherlands 21,337.
Semimanufactures	4	(1)	All to Nigeria.
Gold, bullion ... troy ounces	945,829	910,367	All to United Kingdom.
Iron and steel:			
Scrap	11,620	5	All to Upper Volta.
Semimanufactures	23	----------	
Manganese ore	472,287	394,094	United States 116,606; Norway 95,514; Netherlands 50,740; Spain 40,737.
Nonferrous metal scrap	[r] 1,302	998	Italy 308; United Kingdom 202; Belgium-Luxembourg 200.
Silver, unwrought and semimanufactures ... troy ounces	4,443	4,827	All to United Kingdom.
Slag, dross, scale, etc	[r] 236	----------	
Nonmetals:			
Clays	----------	38	United Kingdom 37.
Diamond ... thousand carats	3,327	1,514	Belgium-Luxembourg 488; United Kingdom 473; Netherlands 453.
Salt	[r] 36	7	All to Upper Volta.
Mineral fuels, thousand 42-gallon barrels petroleum, residual fuel oil.	----------	[2] 123	All to Netherlands.

Revised. [1] Less than ½ unit. [2] Does not include reexports.

Source: Central Bureau of Statistics, External Trade Statistics of Ghana.

TABLE 3.—Ghana: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:[1]			
Aluminum and aluminum alloys:			
Unwrought	939	194	Switzerland 107; United Kingdom 68.
Semimanufactures	3,358	7,323	United Kingdom 6,829; U.S.S.R. 104; Italy 99.
Copper, semimanufactures	749	777	United Kingdom 634; France 41; Austria 37.
Gold:			
Bullion troy ounces	1,425	7,034	All from United Kingdom.
Partly worked do		1,094	Do.
Iron and steel:			
Pig iron, ferroalloys, and scrap	[r] 232	297	United Kingdom 292.
Ingots and similar forms	27	43	United Kingdom 27; Yugoslavia 16.
Rolled products	48,836	50,788	United Kingdom 14,399; Belgium-Luxembourg 11,304; West Germany 7,599; Italy 4,349.
Pipes and fittings	10,072	11,414	United Kingdom 5,875; West Germany 1,991; Italy 1,629.
Castings and forgings	2,053	4,073	Italy 2,075; Northern Rhodesia (Zambia) 718; Southern Rhodesia (Rhodesia) 504.
Lead:			
Ore and concentrate	6	9	All from Nigeria.
Unwrought and semimanufactures.	280	407	Belgium-Luxembourg 280; United Kingdom 74.
Magnesium and beryllium	27	279	India 200; United Kingdom 40; France 20.
Nickel ore		1	All from Switzerland.
Silver troy ounces	NA	6,368	United Kingdom 6,327.
Tin long tons	528	145	United Kingdom 114; U.S.S.R. 22.
Zinc	66	99	United Kingdom 76; Belgium-Luxembourg 16.
Nonferrous metals, unspecified	13	239	Netherlands 110; United Kingdom 77.
Nonmetals:			
Brick and tile	2,888	3,659	West Germany 1,583; United Kingdom 812; Italy 427.
Cement thousand tons	455	388	Poland 163; East Germany 61; U.S.S.R. 50.
Clays	1,174	2,019	United States 1,195; United Kingdom 368; Italy 141.
Fertilizers:[r]			
Nitrogenous	617	80,718	U.S.S.R. 79,941.
Phosphatic	1,688	1,277	U.S.S.R. 676; Belgium-Luxembourg 278; Netherlands 226.
Potassic	462	1,223	U.S.S.R. 658; Nigeria 406.
Other, unspecified	168	355	United Kingdom 143; Netherlands 112; U.S.S.R. 98.
Lime	5,990	7,198	United Kingdom 7,041.
Salt	359	2,695	West Germany 1,774; United Kingdom 424; Ivory Coast 314.
Sand, gravel, stone, and shale	695	2,661	Italy 2,447; West Germany 162.
Other, unspecified	1,147	3,045	France 1,477; United Kingdom 1,232.
Mineral fuels:			
Coal, coke and briquets	29,291	42,289	Nigeria 31,396; Poland 10,278.
Petroleum:			
Crude thousand 42-gallon barrels		1,440	Nigeria 1,025; Libya 415.
Refinery products:			
Gasoline do	1,193	847	Venezuela 266; Netherlands 182; Italy 154; France 149.
Jet fuel do	116	105	Venezuela 54; Italy 27; France 20.
Kerosine do	368	216	Venezuela 88; Italy 56; Netherlands 38; France 21.
Distillate fuel oil do	1,418	1,279	Venezuela 465; Italy 329; Netherlands 280.
Residual fuel oil do	225	367	Italy 143; United States 112; Netherlands West Indies 45.
Lubricating oil do	110	103	United Kingdom 42; United States 36; Netherlands 20.
Total liquid refinery products do	3,430	2,917	
Grease	764	1,411	West Germany 825; United Kingdom 299; United States 162.
Other	[r] 1,845	2,251	Indonesia 1,017; West Germany 452; United States 285; Netherlands 260.
Asphalt, including natural	[r] 39,795	7,603	Netherlands 4,951; Netherlands West Indies 2,299.

[r] Revised. NA Not available.

[1] Includes unwrought, scrap, and semimanufactures.

Within the broad group of mineral imports, some of the major items and their values were petroleum refinery products, $16.4 million; cement, $8.2 million; steel rolled products, $7.3 million; and aluminum (unwrought and semimanufactures) $5.4 million.

Because of the new petroleum refinery, value of imports of petroleum refinery products amounted to 32 percent of total mineral imports, down considerably from the 41 percent of such imports in 1962.

The United Kingdom furnished a major share of the metal imports, particularly in aluminum and iron and steel. This country also contributed 32.8 percent of total imports in 1963; $119.9 million worth out of a total of $365.2 million of imports.

The United States furnished small amounts of petroleum refinery products and clay to Ghana. Total of all U.S. exports to Ghana were valued at $23.4 million and comprised 6.4 percent of total imports.

European Communist countries furnished Ghanaian imports valued at $33.9 million (9.3 percent of the total) and received exports valued at $34.6 million (11.4 percent of total exports). Of the imports of cement, Poland furnished 42 percent, East Germany 16 percent, and the U.S.S.R. 13 percent. The U.S.S.R. furnished most of the fertilizer. No significant mineral exports went to these countries.

For the first 7 months of 1964, Ghanaian exports and imports were valued at $214.0 million and $181.9 million, respectively, for a favorable trade balance of $32.1 million.

COMMODITY REVIEW

METALS

Aluminum.—Construction began on the $128 million aluminum smelter of Volta Aluminum Co., Ltd. (VALCO) (a consortium of Kaiser Aluminum and Chemical Industries and Reynolds Metals Co.) at Tema with dredging of the Tema harbor and preparation of the 500-acre plant site. Formal ground-breaking ceremonies took place on December 5, 1964. When operating in 1967, the plant is expected to produce about 100,000 tons of ingots per year from imported alumina and consume about half the power generated at the dam at Akosombo on the Volta River.

The dam at Akosombo was essentially completed by the end of 1964. Generation of hydroelectricity is expected by late 1965. Plans to use the power not required by the VALCO smelter have yet to be completed.

Ghana Aluminum Products Ltd., a fabricating company owned by the Government of Ghana and Aluminium Limited of Canada, was operating at less than full scale in 1964 because of delays in licenses for raw material imports.

Bauxite.—British Aluminium Co., Ltd. (BAL), owned 47.7 percent by Reynolds Metals Co., continued to be the only bauxite producer in Ghana. Exports of 268,704 tons in 1964 were 27 percent higher than those of 1963.

The Government of Ghana indicated an active interest in studying production of alumina from domestic bauxite and the use of such alumina for local smelting.

Gold.—Ashanti Goldfields Corp., Ltd., produced about 450,000 troy ounces of gold in 1964 to continue its position as the country's leading gold producer. The company chairman pointed out that high taxation, 77.3 percent of the 1963–64 profits, were hurting the company, because insufficient funds remained to develop the mine's potential, and high taxes on engineers and technicians was making employment in Ghana financially unrewarding.[5]

The State Mining Corporation reported that its gold production for fiscal year 1963–64 would be 373,637 ounces valued at $13.1 million. Of this, $7.1 million would be spent on equipment and other commitments of foreign origin and the rest applied toward acquiring foreign exchange.[6]

At yearend, the Government was still considering acquisition of the Konongo Gold Mines, Ltd. This company informed the Government that, although a few small pockets of good ore had been found, it intended to cease operations in March or April 1965. If this company becomes Government-owned, Ashanti will be the only privately owned gold mining company remaining in operation.

The Ministry of Industries announced in August that a $515,200 gold refinery would be built at Tarkwa, to go into operation about the end of 1966. Under an agreement signed in 1963, the Ghana Government will provide the refinery building and the U.S.S.R. will provide equipment and necessary personnel.[7] Reportedly, the refinery will have an annual output capacity of 30 tons of refined gold when completed.

Iron and Steel.—Late in the year, President Nkrumah formally opened the new steelworks at Tema, the first in west Africa. The plant, built at a cost of approximately $5.6 million, will melt scrap metal and reportedly has an output capacity of 30,000 tons of finished products per year.[8]

Manganese Ore.—The African Manganese Co., Ltd., continued as the only significant producer of manganese in Ghana. Total manganese production increased 13 percent over 1963 production. Exports were reported as 505,986 tons valued at $12.1 million. Exports by grade and value for 1963 and 1964 were as follows:

Grade	Tons 1963	Tons 1964	Value (thousand dollars) 1963	Value (thousand dollars) 1964
Battery grade	25,577	13,887	$2,036	$1,104
30 percent or more Mn	368,514	480,591	9,208	10,803
Less than 30 percent Mn	--------	11,508	--------	234

NONMETALS

Diamond.—Production declined slightly in 1964, and of the total of 2,668,276 carats, 2,289,678 were from private company operations and 378,698 were from digger (individual African miner) production. Major exports were to Belgium-Luxembourg, 972,712 carats; Netherlands, 551,825 carats, and United Kingdom, 531,047 carats. The United States imported 247,404 carats valued at $1,163,000.

---

[5] Mining Journal (London). V. 263, No. 6728, July 31, 1964, p. 75.
[6] Mining Journal (London). V. 263, No. 6727, July 24, 1964, p. 67.
[7] Africa Report. Cheam, United Kingdom. V. 9, No. 9, October 1964, p. 23.
[8] Mining Journal (London). V. 263, No. 6743, Nov. 13, 1964, p. 357.

An encouraging event in the diamond field during the year was the beginning of the program to expand the production facilities of Consolidated African Selection Trust (CAST). This project, slated to be completed in July 1965, was expected to increase CAST's production from 1.8 million carats per year to an estimated 2.5 million carats per year.

The main feature of the scheme was a new 50,000-cubic-yard per month washing plant. This plant would replace three older plants with a combined capacity of 24,000 cubic yards per month. Total cost of the program was estimated at $8.4 million, making CAST second only to the Volta aluminum consortium as an investor in the private sector of Ghana's economy.

The African diggers continued to shun the Government Diamond Marketing Board in spite of the Board's policy of overpricing digger produced stones and underpricing private company production. Recorded digger production was down by 9,444 carats compared with 1963, largely because of production diverted to the markets in Nigeria and the Ivory Coast. The recorded loss was probably only a fraction of the actual decrease as there was no effective control of digger activities.

During late 1964, the Government decided to enter the diamond producing field and to establish a state corporation for this purpose. Plans were to withdraw all diggers' licenses, and to concentrate all mining, other than that carried on by CAST, Akim Concessions, and Cayco Ltd., under a Government organization. This corporation would enforce new measures to control trading; all diggers in its employ would be checked, issued identification discs, and be photographed and fingerprinted. The diggers would be paid for their output on a basis of 40 percent of their findings for themselves and 60 percent to the corporation.

At yearend, the Government had under consideration a Government-sponsored dredging project for the Berim River which was estimated to give an annual recovery of 1.8 million carats.

Limestone.—A press release of the Geological Survey in June announced that the Soviet geological team exploring in the Northern Region had found a limestone deposit containing about 11 million tons at Buipe, a small town 88 kilometers northeast of Kintampo.

MINERAL FUELS

Petroleum.—When the Tema refinery went on stream in June 1963, the marketing companies then operating in Ghana had a 3-year processing agreement with the refining company, Ghanaian Italian Petroleum Company (GHAIP), by which they supplied the refinery with crude oil from their own sources and received refinery products in proportion to their shares in the domestic market. The surplus of residual fuel oil of about 3,000 barrels per day was exported by these marketing companies. Early in 1964, the Ghana Government reached a trade agreement with the U.S.S.R. to purchase between June and December 500,000 tons of Russian crude oil to offset Ghana's favorable trade balance with the U.S.S.R. At the Government's insistance, the marketing companies agreed to distribute products refined from this crude oil. The volume to be furnished was greatly in excess of Ghana's estimated inland consumption—about 16,600 barrels-per-day compared with 12,000 barrels-per-day consumption—and consequently the expected surplus of residual fuel oil was greatly increased; the marketing companies, with the apparent exception of the Italian company, AGIP, S.pA. (formerly Azienda Generale Italiana Petroli, S.p.A.), have declined to accept any of these surpluses for export.[9] At yearend none of this Russian crude oil had been delivered.

In August, the Ghanaian press reported that Rumania would supply Ghana with two oil drilling rigs and provide technical assistance for petroleum exploration. The rigs and assistance are valued at about $147,000. The project calls for wells to be drilled near Keta and for geological and geophysical surveys of the Tano and Volta basins.

SOURCE MATERIALS

The foreign trade statistics for Ghana were derived from the official publication, External Trade Statistics of Ghana, 1962 and 1963, published by the Central Bureau of Statistics, Accra. Preliminary data for 1964 trade were from the Quarterly Digest of Statistics, September 1964, also published by the Central Bureau of Statistics. General economic data were obtained from Economic Survey 1963, by the Central Bureau of Statistics.

General data on the mineral industry were from despatches of the Minerals Attaché, Accra, R. G. Murchison, other despatches of the U.S. Embassy, Accra, and from trade journals.

---

[9] Petroleum Press Service. V. 31, No. 7, July 1964, p. 270.

The Mineral Industry of Guinea

⁂

By Benjamin H. Lim [1]

GUINEA'S mineral output in 1964 showed a sizable increase over that in 1963. The increases were primarily achieved by iron ore and diamond, while alumina gained slightly. Significant mineral industry events in Guinea in 1964 included the completion of plans to exploit the vast Boke bauxite deposits, the conclusion of discussions regarding exploitation of iron deposits in the southeastern part of the country, and the expansion of operations to mine the newly discovered kimberlite pipes in the Kerouane area.

Although Guinea was primarily an agricultural country, the composition of its mineral production and exports in 1964 reflected the growing importance of minerals to the economy. This recent trend has been due to the mining operations of two international companies: Compagnie Internationale pour la Production de l'Alumine (FRIA), for alumina, and, to a smaller extent, Société Minière de Conakry, for iron ore. In 1964, FRIA mined approximately 1.4 million tons of bauxite and produced about 484,000 tons of alumina. Value of the alumina output constituted about 80 percent of Guinea's total mineral production in 1964. Iron ore production increased from 662,000 tons in 1963 to 767,000 tons in 1964. Guinea's production and export of other minerals, however, have declined in recent years. In 1960, the bauxite exports of Société des Bauxites du Midi (BAMIDI) from a deposit on Kassa Island totaled 540,600 tons. However, following the termination of BAMIDI's concession in 1961, bauxite production other than that mined by FRIA dropped to 67,000 tons in 1963 and was 158,000 tons in 1964. Gold and diamond exports have declined, chiefly because of illegal outflows to neighboring countries.

Mineral production and exports are expected to increase substantially when the newly established Compagnie des Bauxites de Guinée, a firm jointly owned by Harvey Aluminum Inc. and the Guinean Government, starts its mining operation in the Boke concession and when the Guinean Government goes ahead with plans to exploit the vast iron ore deposits in the Nimba and Simandou mountain ranges.

GOVERNMENT POLICIES AND PROGRAMS

Guinea's resources of bauxite, iron ore, and diamond are great advantages to a developing country, which strives to fulfill the rising expectations of its people. Fully aware of these natural resources, the framers of Guinea's second economic plan, the new 7-year plan (May 1, 1964, to April 30, 1971), continued the general guidelines of the country's first economic plan (1960–63), which emphasized the development of the country's basic sectors: Mining, manufacturing, and agriculture. In the minerals field, final plans to exploit one of the world's richest bauxite deposits at Boke were completed. Concomitant with the broad economic objectives in the industrial sector, large investments have also been allocated for the public sector in matters of education and welfare to achieve a balanced growth.

---

[1] Physical scientist, Division of International Activities.

Viewing the old and new plans as a whole, the objective of the Government has been to lay a solid economic infrastructure upon which to construct an economy to utilize, but not to be dependent upon, the country's mineral wealth; and thereby attempt to achieve the plans' ultimate aims of restructuring the economy from the present essentially rural, agrarian, barter society to one having the advantages of an exchange market. In its efforts to attain these goals, the Guinean Government has encountered several difficulties. The country had been struggling with insufficient investment funds despite large grants from both non-Communist and Communist nations. These grants not only have supported the country's development programs but also have covered much of the cost of Guinea's unfavorable balance of trade during the last few years. Also, the country's labor force still lacked the necessary skills required in a modern industrial complex. Moreover, before its mineral resources can be exploited systematically, a comprehensive mapping program should be conducted, especially in the iron ore areas of the Nimba Mountains.

PRODUCTION

Bauxite, iron ore, and diamond remained Guinea's only mine products of importance in 1964, and output of each increased over the 1963 level. Of the three commodities, both in terms of weight and value, bauxite mining was the largest. Total mineral output value during 1964 was approximately $40 million, about $5 million above the 1963 output. The largest gain was recorded by iron ore production, which more than doubled the 1963 output. Industrial diamond output also increased significantly. Alumina production, however, only made a modest gain of 4,000 tons over that of 1963 and virtually reached the peak capacity of the Kimbo plant of Compagnie Internationale pour la Production de l'Alumine (FRIA).

TABLE 1.—Guinea: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Bauxite	1,378,000	1,766,677	1,450,000	1,663,983	1,678,300
Alumina	185,289	390,336	458,432	480,035	484,350
Iron ore thousand tons	776	542	700	662	767
Nonmetals:					
Diamond:					
Gem carats	[e] [1] 446,500	[e] [1] 490,000	[e] [1] 140,000	[1] 22,000	[2] 20,568
Industrial do	[e] [1] 670,000	[e] [1] 730,000	[e] [1] 210,000	[1] 32,000	[2] 51,166

[e] Estimate.

[1] Sales on tender only. Some additional stones were probably sold abroad by the Guinean Government and much local production is believed to have been diverted to Liberia. Moreover, some of the stones sold by tender were stones originating in adjoining countries, other than Liberia.

[2] Exports.

TRADE

Complete details of Guinea's foreign trade for 1963 and 1964 were unavailable; published information was confined to data on 1963 exports of the major mineral products, alumina, iron ore, diamond, and bauxite, and to overall import data. Recorded mineral exports in 1963 were valued at approximately $35.2 million. Of this total, $30.5 million was for alumina, $3 million for iron ore, $1.4 million for diamond, and $310,000 for bauxite. The remainder of Guinea's total exports for 1963, about $14.5 million, consisted largely of agricultural products. Thus, mineral exports accounted for more than 80 percent of Guinea's total exports in 1963. Cameroon, Norway, and France each received nearly 100,000 tons of alumina from Guinea in 1963, while Poland received almost 48 percent of the iron ore export. Mineral exports to the United States for the year were chiefly confined to a modest quantity of alumina, valued at about $3 million.

Guinea's imports in 1963 totaled $50 million, leaving a trade deficit of $6 million for the year. Imports during the year presumably again consisted mainly of consumer goods with very little semimanufactured mineral products. The United States was, by far, Guinea's major supplier and accounted for $14.4 million or 28 percent of the country's total 1963 imports. Most of Guinea's imports from the United States were financed by the Agency for International Development (AID) funds and consisted mainly of refined petroleum products, vehicles, spare parts, electronic equipment, and textiles. The U.S.S.R. and France each supplied approximately $8 million, about 16 percent of the total worth of good and services to Guinea in 1963. Most of the imports from France, however, were for FRIA. In addition to these major countries, Guinea did some trading in 1963 with Eastern European nations and mainland China. Trade with Communist countries as a whole accounted for about 37 percent of Guinea's 1963 imports and 28 percent of its exports.

TABLE 2.—Guinea: Major exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Bauxite	[1] 44,389	166,649	Chiefly to Eastern European countries.
Alumina	457,653	487,723	Cameroon 99,920, Norway 96,920, France 96,660.
Iron ore	719,495	701,053	Poland 334,000, United Kingdom 157,941.
Nonmetals: Diamond carats	[1] 350,000	71,734	NA.

NA Not available.

[1] January–September only.

COMMODITY REVIEW

METALS

Aluminum.—The Kimbo plant of FRIA, Guinea's only alumina producer, operated at or very near capacity throughout 1964. During the second quarter of the year, Harvey Aluminum Inc. received United States governmental approval to develop the high-grade trihydrate bauxite deposits in the entire northwest area of Guinea, known as the Boke bauxite reserve. Under the agreement between Harvey Aluminum and the Goverment of Guinea, consummated in October 1963, the designated area is bounded on the northwest by the frontier of Portuguese Guinea, on the southwest by the Atlantic Ocean as far as the mouth of Fatala River, then by the Fatala River as far northeast as Telimele, from which point the boundary is the main road from Telimele to Gaoual to Kifaya to Youkounkoun prolongated to the frontier of the Republic of Senegal. Then the boundary turns east-westward along the frontier as far as the intersection of the borders of the Republic of Guinea, the Republic of Senegal, and Portuguese Guinea.[2] The Boke concession was previously held by the French firm, Société des Bauxites du Midi (BAMIDI), a wholly owned subsidiary of Aluminium, Ltd., of Canada. The agreement provided that Harvey would pay 65 percent of the profits as well as taxes to the Government of Guinea. In turn, the Guinean Government agreed to finance the construction of roads, living quarters, a new 135-kilometer railroad, and a new port to handle modern ore vessels.[3]

Halco Mining Co., a subsidiary of Harvey Aluminum, received in mid-1964 U.S. Agency for International Development (AID) initial risk guarantees to protect the firm's $20 million bauxite development against risk of inconvertibility, expropriation, revolution, and insurrection. Mining operation are expected to start as soon as the railroad and port facilities are completed. The bulk of the production will be shipped to Harvey Aluminum's alumina plant under construction in the Virgin Islands.[4] Late in 1964, the jointly owned firm, Compagnie des Bauxites de Guinée (Harvey 51 percent and the Guinean Government 49 percent), was negotiating with world bauxite users to establish long-term supply agreements for raw material from Boke. Discussions also took place to supply metallurgical, chemical, calcined abrasive, and calcined refractory grades of bauxite products from the Virgin Island plant.[5]

Iron Ore.—Guinea's iron ore production in 1964 was more than double that of 1963. At yearend there were three large iron ore deposits known in Guinea, the Kaloum Peninsula, the Nimba-Guinea area near the Liberian border, and the Simandou Mountain Range. The Kaloum deposit, mined by Société Minière de Conakry, contains a lateritic iron ore overlying dunite. The thickness of the ore varies, extending to relatively shallow depths in some areas but extending to more than 300 feet in others. At present only thicknesses as much as 20 feet have been mined. The deposit is divided between a hard crust of the upper surface and a soft ore layer in the lower depths. Reserves have been calculated only for the upper layer, graded according to chromium content. Published figures for the ore with 50 percent iron content and less than 1 percent chromium amounted to about 45 million tons, whereas reserves of ore with more than 1 and less than 2 percent chromium content have been estimated to total 170 million tons. If the soft lower layer is included, Guinea's proven iron ore reserves total about 2,000 million tons. The average chemical analysis of the upper crust was iron 53.2 percent, silicon dioxide 1.6 percent, phosphorus 0.08 percent, chromium 1.02 percent, combined water 10.1 percent, and moisture 11.2 percent. The relatively high chromium content of the ore has made it difficult to find a market, especially during the last few years when world iron ore supply exceeded demand. In 1964, the ore was being tested to find an economic means to remove the chromium.

---

[2] American Metal Market. Development of Guinean Bauxite by Harvey in an Advanced Stage. V. 71, No. 231, December 1, 1964, p. 12.
[3] World Mining. V. 17, No. 6, June 1964, p. 47.
[4] Metal Bulletin (London). No. 4913, July 14, 1964, p. 27.
[5] Metal Bulletin (London). No. 4948, November 17, 1964, p. 21.

The Nimba-Guinea and Simandou Mountains' deposits in Eastern Guinea were discovered in the last few years. A group of European banking firms, Consortium de Banques pour l'Exploration et l'Exploitation des Minéraux d'Afrique (CONSAFRIQUE), were granted long-term exploration rights several years ago. The main partners of the consortium were Hambros Bank, the Banque de l'Indochine, and the Deutsche Bank. United States' and Japanese steel manufacturing companies also joined the consortium in the last few years. In 1964, detailed discussions on the various alternatives to exploit these deposits were continued between representatives of CONSAFRIQUE and the Guinean Government. Exploitation of the Nimba deposit presents difficulties for topographic and geographic reasons. The enrichments are found 2,400 to 3,300 feet above the surrounding plain and 5 to 8 kilometers from the nearest possible truck loading point. The shortest routes to ocean ports run through Liberia. Although the Liberian Government has granted free movement of Guinean ore to the Atlantic coast (Port Buchanan), hauling the ore through Guinea by building a 160-kilometer railroad to connect with the Kankan-Conakry line (640 kilometers) has been offered as another possibility.[6]

NONMETALS

Diamond.—Guinea's diamond production in 1964, estimated from the sales on tender, was approximately 72,000 carats compared with 54,000 carats recorded in 1963, representing an increase of 33 percent. The gain was made in industrial diamonds, while gem stones decreased by about 1,400 carats compared with 1963 output. Value of the 1964 sales was estimated at $2 million.

Since the 1960 nationalization of the two French diamond mining companies, Société Guinéenne d'Exploitation de Diamants (SOGUINEX) and Compagnie Minière de Beyla (COMIB), the Guinea Government has employed Soviet technicians and geologists to operate the mines and make extensive surveys of possible diamond-bearing ores in the Kerouane area. The investigations later proved fruitful in discovering several new diamond bearing kimberlite pipes. In addition to the diamond found in the pipes, ilmenite, zircon, epidote, and a number of other minerals have also been found to occur frequently and may prove commercially feasible to extract. To exploit the new kimberlite pipes, the Guinean Government is planning to make heavy investments to replace the obsolete equipment and also to expand present capacity several times.[7]

---

[6] Danielsson, C., and S. Ivarsson. Iron Ore Developments Surge in West Africa. J. Metals, v. 15, No. 5, May 1963, pp. 377–381.

[7] République de Guinee. Les Richesses Minières de la Guinee. Le Diamant. Ch. in Revue du Developpement Économique. No. 3, November 1964, pp 11–13.

The Mineral Industry of the Ivory Coast

By Benjamin H. Lim[1]

◆

THE Ivory Coast produced only a small quantity of minerals in 1964, valued at about $6 million, less than 1 percent of the country's 1964 gross national product estimated at $820 million. Of the total, diamond accounted for $3.7 million and manganese ore for $2 million. Columbite-tantalite ore was produced only in kilogram amounts and output was valued at less than $3,000. Mineral exploration in 1964 resulted in finds of indications of bauxite and gold deposits, but none was proved to be exploitable. However, large quantities of manganese ore discovered in the Odienne area last year were confirmed by more extensive investigations in 1964. In anticipation of future mineral discoveries in the Republic, the Ivory Coast Government passed a new mineral code on July 1, 1964, which gave the Government a more direct control and larger interest in the mining industry.

Mineral exports during 1963 consisted mainly of diamond and manganese ore with values about the same as the value of their production, and this was presumably true again in 1964. Mineral imports during 1963, chiefly from France, primarily consisted of iron and steel semimanufactures, cement, fertilizers, and petroleum products. The latter were imported mainly from Venezuela. The Ivory Coast's total foreign trade during 1963 amounted to about $400 million, $230 million for exports and $170 million for imports. Ivory Coast's chief exports, reflecting its agricultural economy, were green coffee, cocoa beans, tropical lumber, and fruits. France, Ivory Coast's major trading partner, accounted for approximately $112 million or 66 percent of the total value of imports and $108 million or 47 percent of the exports. The United States, second largest purchaser of Ivory Coast's exports in 1963, accounted for $32 million of the total exports but only $8 million of its imports. The U.S. purchases were primarily coffee, cocoa beans, and other tropical agricultural products in addition to diamond and manganese ore. Purchases of U.S. goods by the Ivory Coast in 1963 consisted mainly of heavy logging and roadbuilding equipment, vehicles, and clothing.

Enjoying a favorable trade balance of between $43 and $61 million annually, Ivory Coast has used this advantage for industrial construction and expansion since its independence in 1960. New plants scheduled to start operation in 1965 include an $18 million petroleum refinery with eventual annual capacity of 700,000 tons of crude and a $1 million cement clinker installation capable of producing 150,000 tons of cement a year. The $18 million Ayame II Dam also was scheduled to be in operation by 1965.

---

[1] Physical scientist, Division of International Activities.

GOVERNMENT POLICIES AND PROGRAMS

The extensive new mineral code for the Republic adopted on July 1, 1964, was published in the Journal Officiel, the official publication of the Government, on July 23, 1964. The salient points of the code were:

(1) All mineral or fossil substances are classified either as quarries or mines. (2) Quarries are considered to be part of the soil and are subject to property laws. (3) Mines are always considered to be the domain of the state. (4) The former authorizations permitting the exploration of given areas are canceled (reportedly because of many abuses by persons who used such authorizations for exploitation). (5) Authorizations for prospection (autorizations de prospection) will continue to be issued to companies in order to facilitate the general exploration of an area before the eventual issuance of a mining permit.

(6) The Government will issue permits of research and permits of exploitation or concessions. Permits of research are issued to companies selected by the Government and approved by the Council of Ministers and holders of such permits will obtain by ministerial decree a permit of exploitation upon proof that an exploitable deposit exists. (7) A concession, for exploitation of important deposits, is given by means of a contract with the Government approved by the Council of Ministers. (8) The issuance of a permit of exploitation may be subject to rents, shares or stock attributable to the Government. (9) The concessions law ("regime des concessions") of the property code being applicable to mineral concessions, it is obligatory that shares or stocks be reserved for attribution to the state. (10) The provisions of the concessions law of the property code are incorporated in the mineral code. (11) The provisions applicable to certain minerals (strategic raw materials, precious stones and metals) and to zones closed to mineral activity are basically unchanged.

PRODUCTION

Of total 1964 mineral output valued at about $6 million, diamond output was valued at $3.7 million and manganese ore amounted to $2.0 million. Increased mineral output was anticipated in the future because of new facilities underway at yearend. The $18 million Ayame II Dam, a $18 million petroleum refinery, and a $1 million cement plant among other facilities were scheduled to be completed by mid-1965.

TABLE 1.—Ivory Coast: Production of metals and minerals

Commodity	1960	1961	1962	1963	1964
Metals:					
Columbium-tantalum concentrate...kilograms..	2,600	3,800	2,618	1,000	1,500
Manganese ore...metric tons..	61,613	124,740	106,983	139,063	136,425
Nonmetals:					
Diamond:					
Gem...carats..	79,648	219,330	102,208	62,659	120,163
Industrial...do....	119,472	330,000	181,703	117,000	80,108
Total...do....	199,120	549,330	283,911	179,659	200,271

TRADE

In 1963, the latest year for which complete detailed trade data were available, the Ivory Coast recorded a positive overall foreign trade balance of about $61 million, but for mineral commodities, a foreign trade deficit of about $17 million was recorded. The relationship of mineral trade to total trade for 1962 and 1963 follows:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total	
Exports:			
1962	5,140	182,462	2.8
1963	4,389	230,330	1.9
Imports:			
1962	18,997	139,948	13.6
1963	22,172	169,737	13.1
Trade balance:			
1962	−13,857	+42,514	XX
1963	−17,783	+60,593	XX

XX Not applicable.

The percentage distribution of mineral commodity trade by major classes of commodities was as follows:

Commodity	Percent			
	Exports		Imports	
	1962	1963	1962	1963
Metals:				
Iron and steel	4.0	7.3	27.1	31.6
Manganese ore	43.2	41.4		
Other	4.4	7.9	2.3	2.5
Total	51.6	56.6	29.4	34.1
Nonmetals:				
Cement, lime, and dimension stone		0.3	16.9	15.1
Diamond	43.9	35.9		
Other	4.4	3.1	10.9	11.4
Total	48.3	39.3	27.8	26.5
Mineral fuels	.1	4.1	42.8	39.4

France remained the dominant trading partner of the Ivory Coast through 1963, and as such, supplied the largest part of all mineral imports, although Venezuela, the first-ranked source of petroleum refinery products, accounted for a sizable share of mineral import values. France also ranked high as a destination for Ivory Coast mineral exports inasmuch as it was the recipient of most of the diamond export. West Germany, Spain, and the United States received most of the Ivory Coast's export of manganese ore, the only export of significance other than diamond.

TABLE 2.—Ivory Coast: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum	2	6	France 4.
Copper	301	338	Belgium-Luxembourg 106; Italy 91; France 69.
Iron and steel:			
Scrap	7,805	4,822	Japan 4,630; Italy 184.
Semimanufactures	23	946	Mali 204; Upper Volta 183; Niger 136.
Lead	100	54	Italy 32; Somali Republic 16.
Manganese ore	97,559	105,301	West Germany 32,481; Spain 21,325; United States 20,131; Sweden 15,779.
Tin long tons	7	----------	
Zinc	----------	18	Belgium-Luxembourg 14.
Other nonferrous metals:			
Ores	141	627	Sweden 534; Netherlands 47; Switzerland 32.
Metal	----------	1	N.A.
Nonmetals:			
Abrasives, natural (except diamond)	NA	3	All to Mali.
Diamond:			
Gem carats	147,530	NA	
Industrial do	268,380	NA	
Total do	415,910	209,565	Mainly to France.
Cement, lime, and dimension stone	----------	275	Upper Volta 167; Mali 72.
Clay products	----------	53	Upper Volta 20; Dahomey 14.
Fertilizers	(1)	143	Upper Volta 136.
Unspecified nonmetals, crude	----------	2,479	Upper Volta 2,390.
Mineral fuels:			
Natural and manufactured gas	----------	62	Bunkers 49.
Petroleum refinery products:			
Kerosine	----------	2,394	Bunkers 2,392.
Distillate fuel oil	----------	1,084	Bunkers 1,079.
Residual fuel oil	----------	89	All to bunkers.
Lubricants	4	86	Upper Volta 43; Mali 39.
Other	30	161	Bunkers 93.
Total	34	3,814	

NA Not available.

COMMODITY REVIEW

METALS

Columbium-Tantalum.—During 1964, Société Anonyme de Recherches et d'Exploitation Minières de Côte d'Ivoire (SAREMCI) produced 1,500 kilograms of columbite-tantalite ore compared with 1,000 kilograms in 1963. Value of the 1964 output was about $2,600. The Bouake deposit was reported to be nearing exhaustion at yearend.

Manganese.—The 1964 output from the Grand Lahou manganese mines, operated by Compagnie Mokta el Hadid, was 118,433 tons of lump ore, containing 40 to 46 percent manganese, and 17,992 tons of fines with a 38-percent metal content. Exports for 1964 were 84,313 tons of lump (104,843 tons in 1963) and 20,236 tons of fines (29,841 tons in 1963). Value of the 1964 exports totaled approximately $2

TABLE 3.—Ivory Coast: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum	201	393	France 365.
Copper	141	118	France 114.
Gold ... troy ounces	8	NA	
Iron and steel:			
Scrap	45	------	
Pig iron and ferroalloys	33	11	France 9.
Steel ingots and equivalent forms	------	1	All from France.
Semimanufactures	r30, 229	39, 222	France 33,142; Belgium-Luxembourg 3,915.
Lead:			
Ore	6	NA	
Metal, all forms	66	82	France 59; Belgium-Luxembourg 23
Nickel	------	14	All from France.
Silver ... troy ounces	518	NA	
Tin ... long tons	12	7	All from France.
Zinc	23	93	France 91.
Other nonferrous metals:			
Ore	------	90	Sweden 79; France 11.
Metal, all forms	------	2	All from France.
Nonmetals:			
Abrasives, natural, except diamond	18	535	France 516.
Cement, lime, and dimension stone	r172, 065	176, 678	France 130,630; Belgium-Luxembourg 32,833.
Clay products	2, 610	1, 829	France 935; West Germany 866.
Fertilizers, processed	r15, 585	13, 228	France 9,455; West Germany 1,725; Belgium-Luxembourg 1,485.
Sand, gravel, and crushed rock	377	858	France 815.
Sulfur and pyrite	7	------	
Unspecified nonmetals:			
Crude	8, 216	28, 874	Senegal 18,746; France 6,489; Algeria 2,481.
Manufactures	211	288	France 213; West Germany 30; Senegal 30.
Mineral fuels:			
Coal, coke, and briquets	191	81	France 80.
Gas, natural or manufactured	1, 565	1, 999	France 1,108; Chile 860.
Petroleum refinery products	200, 267	215, 653	Venezuela 99,559; Syria 48,056; France 32,659; Kuwait 23,327.

r Revised. NA Not available.

million. It was expected that manganese ore exports would increase by about 25 percent in 1965 because a buyer reportedly was found for the 40-percent ore presently being stocked. Known manganese reserves in the Grand Lahou area at yearend were estimated at approximately 600,000 tons of lump ore and 150,000 tons of fines.

The Ziémougoula manganese deposits underwent further geological exploration by the Société pour le Développment Minier de la Côte d'Ivoire (SODEMI), a public corporation owned by the Ivory Coast Government and also the official exploration agency in the country. Preliminary investigation of the deposit included a systematic network of pits and trenches, drilling, and geophysical studies to ascertain the possible extent and value of the orebodies. Topographic expression of the orebodies varied. Some of them, for example, were relatively steep mounds, while others were rather flat outcrops covered by a thin mantle of laterite. Preliminary analyses indicated that an average of 80 percent of the ore was made up of pseudoramsdellite or battery grade manganese dioxide of N'Sutra type. The Odienne manganese deposit was reported to contain 1.2 million tons of proven ore reserves and 2 million tons of probable reserves.

Titanium.—Preliminary results from the studies of the ilmenite reserves in heavy sand deposits between Jacqueville and west of Grand Lahou indicated a reserve of about 400,000 tons of ore with a titanium content of about 50 percent. Although beneficiation studies were made in 1963, there were no immediate plans in 1964 to exploit the mineral.

NONMETALS

Diamond.—Value of 1964 diamond production was approximately $3.7 million, slightly less than that for 1963. However, there was an increase of about 21,000 carats in 1964 over the 1963 output. The increase was largely due to an improvement in ore grade, which was raised from 0.29 to 0.31 carat per cubic meter of ore, but also resulted from increased ore output. SAREMCI produced 175,753 carats in 1964 (155.164 carats in 1963) from its Tortvia deposit. The firm's affiliate, Société Minière des Bandamas (S.M.B.), produced 1,212 carats in 1964, 542 carats more than in 1963. It was reported in early 1964 that diamantiferous reserves discovered below the Tortyia deposit on the Bou River will enable S.M.B. to produce about 12,000 carats in 1965. Output of Société Diamantifère de Côte d'Ivoire (SODIAMCI) amounted to about 23.200 carats in 1964 compared with a target of 40,000 carats. The projected production was not met on account of the impoverishment of ore and unexpected delays in putting the new concentration plant into operation.

Société Waston, an affiliate of Diamond Distributors, Inc., New York, N.Y., continued its exploration program during 1964 in the Séquéla diamond area. Preliminary results indicated that about 300,000 carats is available in the area and that a small-scale recovery operation is commercially feasible. Corporation Côte d'Ivoire, Ltd., an affiliate of the South African De Beers Consolidated Mines, Ltd., explored the Mane Tourbe region in 1964. Initial results from exploratory studies were not promising, but indications of diamond were found in the Bouake-Mantono-Katiobe region.

MINERAL FUELS

Petroleum.—In December 1964, Société Ivoirienne de Raffinage (SIR) started laying a 24-inch diameter pipeline on the sea bottom just off the country's capital, Abidjan, as one of the initial steps toward the construction of the $18 million refinery with an estimated annual capacity of 700,000 tons of crude petroleum. The refinery was expected to go on stream by the end of 1965.

SIR is a joint-venture company involving several American petroleum companies, the Bureau de Recherche Pétrolière (French Government), Compagnie Française de Pétrole, and the Government of the Ivory Coast. The pipeline will be approximately 5,600 feet long when completed in early 1965 and will permit oil tankers to deliver about 275,000 barrels per day of crude directly to the refinery. The pipeline was necessary because the Vridi Canal, through which ships enter Abidjan harbor, cannot accommodate vessels weighing 35,000 tons or over.

The Mineral Industry of Kenya, Tanzania,[1] and Uganda

By Thomas C. Denton[2]

◆

IN 1964, Kenya, Tanzania, and Uganda continued membership in the East African Common Market (EACM) and in the East African Common Services Organization (EACS). The heads of the three governments are the controlling authority for both EACM and EACS. The currency of each country continued to be East African currency, a decimal currency in which the standard unit is the East African shilling, exchangeable in London at the rate of 20 shillings for 1£ sterling.[3]

The part of the EACS vital to the mineral economies of the three countries is the East African Railways and Harbours Administration (EARH). In 1964 EARH operated the second largest railroad system in Africa, having 5,800 kilometers of lines and serving 288 stations in Kenya, Tanzania, and Uganda. It also operated harbours handling 5.2 million deadweight tons (4.4 million in 1963), and buses and lake vessels. Total revenue in 1964 was $84.3 million. Salaries and wages paid by EARH amounted to $30 million ($28.9 million in 1963) and staff totaled 44,587 persons (44,731). Earnings in 1964 were about $78 million (£28 million).

Africanization of EARH staff continued. During the year the number of European graded employees decreased from 899 to 709, and the number of Asian graded employees from 3,320 to 2,259. The number of Africans in that class increased from 10,928 to 11,713.

Africanization at higher levels also increased. At yearend there were 24 Africans in superscale grades compared with 5 at the beginning of the year.[4]

In April 1964 the Ministers for Finance and the Ministers for Commerce and Industry of the three countries met in Kampala, Uganda, to discuss common market problems. The result was the "Kampala Agreement." In part, the agreement provided that as a temporary measure intended to redress imbalances a quota system and a suspended quota system would be applied in order to limit exports from surplus countries to deficit countries. It also granted exclusive or near exclusive manufacturing rights by country. For example, Uganda was to have sole rights to manufacture bicycles and nitrogenous fertilizers, and Kenya to produce electric lightbulbs.[5]

---

[1] Formerly The United Republic of Tanganyika and Zanzibar.

[2] Africa specialist, Division of International Activities.

[3] Where necessary, values have been converted from East Africa shillings (EAS) at the rate of EAS1=US$0.14 and from pounds sterling (£) at the rate of £1=US$2.80.

[4] East African Railways and Harbours Administration (Nairobi, Kenya). EARH Annual Report, 1964.

[5] Tanganyika and Zanzibar Trade Journal (Dar es Salaam). No. 9, July–September 1964, p. 18.

KENYA

In 1964 the mineral industry, exlusive of petroleum refining, provided nearly 2 percent of the gross domestic product of Kenya of $829 million in current prices. Salient statistics for the industry in 1963 (most recent year for which information was available) were as follows:

Prospecting and mining expenditure in millions	$5
Number of persons employed:	
Africans	1,360
Asians	109
Europeans	94
Total	1,563
Basic cash wages paid:	
Africans	552,236
Asians	240,416
Europeans	663,076
Total	1,455,728

Reportedly, the most serious problem of Kenya mineral industry in 1964 was the rapid rate at which staff of the Mines and Geological Department was being depleted.[6] At yearend, the Department had become primarily an administrative agency. There were only 4 permanent staff geologists, compared with 12 or 13 in 1960. However, there were also three Canadian economic geologists, two Kenya Asian trainee geologists studying in New Zealand, and one economist-geologist expected from the United Kingdom.

An investment guarantee agreement between the Kenya Government and the U.S. Government was signed on April 20, 1964, and on June 16 a bill designed to protect foreign investment was introduced in the Kenya House of Representatives.

Kenya and the United Nations Special Fund signed an agreement during the year to conduct a survey of mineral resources in the Nyonga region on the shore of Lake Victoria. The survey will last for about 2½ years, when $896,000 will be spent, of which the Kenya Government will provide $406,000. The campaign will cover 23,000 square kilometers and will be directed mainly toward investigation of gold and base metals possibilities.

GOVERNMENT POLICIES AND PROGRAMS

Under the new constitution all land vested in the regions would be revested in the central government without compensation. Trust lands, however, will remain vested in county councils. The President has stated that the Government would have full control over land utilization and exploitation of minerals.[7]

On December 12, 1964, the first anniversary of Independence, Kenya became a Republic within the British Commonwealth of Nations.

PRODUCTION

The value of Kenya's mineral production in 1964 was $15.6 million, about $1.6 million larger than in 1963. As in 1963 and earlier years, cement and soda ash together contributed about 75 percent of the total.

---

[6] U.S. Embassy, Nairobi, Kenya. Department of State. Airgram A-862, May 28, 1965.
[7] Mining Journal (London). Mining-Annual Review 1965. p. 195.

TABLE 1.—Kenya: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Beryl	1	1	---	---	---
Columbite ... kilograms	175	---	[1] 375	---	---
Copper, concentrate	1,784	2,564	2,225	2,244	2,077
Gold ... troy ounces	8,646	12,299	9,327	10,193	12,475
Silver ... do	35,797	40,731	50,160	52,422	47,702
Nonmetals:					
Asbestos	106	137	192	70	185
Carbon dioxide, natural	840	648	465	517	746
Cement [2] ... thousand tons	353	330	346	340	336
Coral	15,842	6,108	2,154	---	---
Diatomite	3,439	3,209	2,909	3,336	3,055
Feldspar	---	1	---	---	---
Gem stones, sapphire and other ... carats	---	1,000	---	800	[3] 2,200
Graphite	1,010	---	---	---	---
Gypsum, other than for cement [2]	17,134	20,085	26,844	20,728	27,994
Kaolin	1,053	741	1,174	6,663	1,284
Kyanite	936	---	---	---	---
Limestone, other than for cement [2]	25,293	20,038	18,284	16,448	12,095
Magnesite	30	1,751	---	261	170
Meerschaum ... kilograms	22,000	1,000	---	6,000	204
Mica ... do	600	100	1,000	800	[e] 800
Mullite	349	---	---	---	---
Pumice	2,459	708	1,128	1,129	1,438
Quartz	---	10	---	259	---
Salt ... thousand tons	22	23	19	16	40
Sandstone	35,406	4,355	49,177	---	---
Soda, raw crushed	2,511	2,295	2,924	2,342	2,220
Soda ash	126,510	144,717	124,081	103,506	81,670
Vermiculite	257	---	20	92	28
Mineral fuels:					
Petroleum refinery products: [4,5]					
Gasoline	---	---	---	20,229	214,895
Kerosine	---	---	---	9,793	113,086
Liquefied petroleum gas	---	---	---	86	4,877
Distillate fuel oil	---	---	---	20,856	223,937
Residual fuel oil	---	---	---	77,363	902,760
Bitumen and other products	---	---	---	---	10,668
Total	---	---	---	128,327	1,470,223

[e] Estimate.

[1] Includes oxides of rare earths.

[2] Cement raw materials were reported for 1964 as follows: Limestone, 544,145 metric tons; volcanic ash 3,051; gypsum, 27,994.

[3] Also, 4.5 kilograms of corundum valued at $1,260.

[4] In 1963 crude processed was 135,606 tons; in 1964 it was 1.5 million tons. Refinery began production Nov. 12, 1963.

[5] Input and output reported in barrels in 1963 and in long tons in 1964. The following barrels per metric tons were used to convert to metric tons: for crude 7.300; gasoline 8.526; kerosine 7.730; distillate 7.462; residual 6.500; and liquefied gas 11.799.

Increased cement output more than compensated for a sharp decline in soda ash production which resulted from loss of the South African market. The breakdown of total value in 1963 and 1964 by major contribution was as follows:

	Thousand dollars	
	1963	*1964*
Cement	7,119	9,081
Soda ash	3,594	2,486
Copper	1,413	1,812
Salt	778	849
Gold	361	471
Silver	70	62
Other	710	799
Total	14,045	15,560

TRADE

The trade embargo that Kenya placed on the Republic of South Africa in December 1963 was continued in 1964 to the detriment of Kenya trade. South Africa use to take over half Kenya's soda ash, at a landed price of about $42 (£15) per ton. Efforts to substitute Japan for South Africa as the principal market for the soda did not come up to expectations. Japanese soda ash manufacturers reportedly requested a delay in importation of Kenya soda because such imports would impair their position in the domestic market.

Anthracite for the British Standard Portland Cement Co. plant at Bamburi, which was formerly imported from South Africa, was being obtained from North Vietnam,[8] presumably at much higher prices. East African Diatomite Syndicate Ltd. was in difficulties because of the Government's policy of trade with South Africa and Portugese East Africa (Mozambique).[9]

TABLE 2.—Kenya: Exports of metals and minerals, to countries outside the East African Common Market

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Copper, concentrate	4,070	3,090	All to Japan.
Gold troy ounces	8,917	8,868	West Germany 8,434; United Kingdom 434.
Iron and steel, scrap	NA	2,955	Japan 1,216; Netherlands 836; Pakistan 756.
Silver troy ounces	46,303	44,114	All to West Germany.
Nonferrous scrap	NA	2,129	Japan 943; Rep. of South Africa 669; Spain 182.
Nonmetals:			
Asbestos	18	NA	
Cement	105,548	110,607	Mauritius 31,520; Aden 24,527; Somalia 14,202; Reunion 12,937.
Diatomite	1,230	1,960	United Kingdom 1,037; Rep. of South Africa 697.
Gem stones, other than diamond. £ sterling	--------	500	All to United Kingdom.
Graphite	82	NA	
Gravel and crushed stone £ sterling	495	60	All to Somalia.
Lime	27	21	Somalia 20.
Mica kilograms	227	1,000	All to Japan.
Salt	692	86	Rep. of the Congo (Léopoldville) 77.
Sand	(1)	4	All to ships stores.
Soda ash, sodium carbonate	112,987	108,588	Rep. of South Africa 61,500; Siam 7,740 Singapore 6,836; India 6,542.
Minerals, crude, not elsewhere classified. £ sterling	1,183	1,034	Ships stores 965.
Mineral fuels:			
Petroleum refinery products:			
Distillate fuel oil 42-gallon barrels	--------	121,671	All to Singapore.
Other do	--------	121	Burundi 79; Rep. of the Congo (Léopoldville) 29.

NA Not available.

[1] Reported in 1962 as valued at £ 18 sterling.

Source: East African Common Services Organization (Nairobi, Kenya). East African Customs and Excise; Annual Trade Report of Kenya, Uganda, and Tanganyika, for years ended Dec. 31, 1962 and 1963.

---

[8] P. 195 of work cited in footnote 7.

[9] Work cited in footnote 6.

TABLE 3.—Kenya, Tanzania (Tanganyika), and Uganda: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	Total		Distribution of total, 1963[1]			Principal sources of total, 1963
	1962	1963	Kenya	Tanzania	Uganda	
Metals:						
Aluminum:						
Unwrought	1,254	1,997	1,762	235	--------	France 1,037; Norway 721.
Semifabricated	1,000	1,090	890	110	90	Switzerland 627; United Kingdom 373.
Copper:						
Unwrought	33	66	62	2	1	United Kingdom 62.
Semifabricated	325	411	205	140	66	United Kingdom 203; West Germany 70; Japan 47.
Gold bullion ....troy ounces	398	3,055	634	1,269	1,152	All from United Kingdom.
Iron ore	3,521	1,704	1,376	328	--------	All from Federation of Rhodesia and Nyasaland.
Iron and steel:						
Pig iron	642	647	501	95	51	United Kingdom 587; West Germany 51.
Ferroalloys	924	1,077	38	874	165	Republic of South Africa 662; West Germany 211; Norway 198.
Ingot steel	2,069	3,101	2,626	289	186	Belgium 1,243; United Kingdom 649; Republic of South Africa 529.
Semimanufactures	130,453	121,541	79,822	26,738	14,981	Japan 48,183; United Kingdom 29,827; Belgium 18,082; West Germany 8,255.
Lead:						
Unwrought	167	181	109	65	8	United Kingdom 79; Australia 67.
Semimanufactures	36	18	7	6	5	Netherlands 6; United Kingdom 5; Belgium 3.
Nickel	7	5	4	([2])	1	United Kingdom 4; Canada 1.
Silver ....troy ounces	479	16	16	--------	--------	NA.
Tin, unwrought ...long tons	207	300	203	58	39	United Kingdom 278; Republic of South Africa 18.
Zinc:						
Unwrought	233	1,706	1,401	305	([2])	Federation of Rhodesia and Nyasaland 1,023; Australia 649.
Semimanufactures	42	44	17	24	3	United Kingdom 26; Republic of South Africa 14.
Nonmetals:						
Asbestos:						
Crude	662	382	--------	--------	382	Federation of Rhodesia and Nyasaland 327; Canada 54.
Building material and pipe	2,769	3,301	2,052	528	721	Republic of South Africa 977; Belgium 750; Yugoslavia 519; France 258.
Manufactures other than building material.	64	136	112	18	6	All from United Kingdom.
Cement	13,420	11,625	771	10,436	418	Japan 7,280; Congo (Léopoldville) 1,626; United Kingdom 870; Poland 850.
Feldspar, fluorspar, cryolite, and chiolite.	3,248	5,207	4,407	--------	800	Republic of South Africa 5,197.
Fertilizers:						
Nitrogenous	26,440	28,078	17,851	6,752	3,475	West Germany 18,816; United Kingdom 4,565; Italy 2,449; Belgium 848.
Phosphatic	14,215	15,507	14,196	655	656	Netherlands 6,256; Italy 4,671; Belgium 2,761; Portugal 759; West Germany 603.
Potassic	3,587	4,080	382	1,686	2,012	Israel 1,794; West Germany 1,713; Netherlands 567.
Other, manufactured, including mixed.	7,255	8,554	6,192	1,516	846	Netherlands 4,405; West Germany 2,311; United Kingdom 532.
Gypsum	388	372	186	15	171	Republic of South Africa 103; Italy 147; United Kingdom 83.
Lime	4,446	3,721	128	3,559	34	Zanzibar 2,407; United Kingdom 1,031.
Mica, crude	18	20	13	7	--------	All from United Kingdom.

See footnotes at end of table.

TABLE 3.—Kenya, Tanzania (Tanganyika), and Uganda: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total		Distribution of total, 1963[1]			Principal sources of total, 1963
	1962	1963	Kenya	Tanzania	Uganda	
Nonmetals—Continued						
Salt	41,402	44,054	9,817	4,197	30,040	Aden 23,774; Ethiopia 14,313; Netherlands 2,271; West Germany 1,679; United Kingdom 1,135.
Sulfur	3,333	2,373	371	276	1,726	United States 1,118; West Germany 863; Belgium 384.
Mineral fuels:						
Solid:						
Coal	43,690	40,833	40,723	37	73	Republic of South Africa 40,659.
Coke	2,161	2,569	1,598	508	463	United Kingdom 2,242; Republic of South Africa 176.
Petroleum:						
Crude thousand tons	--------	221	--------	221	--------	British Commonwealth countries 136; Iran 84.
Refinery products:						
Gasoline thou. 42-gal. bbl	2,743	2,533	1,121	715	698	Iran 1,665; Bahrein 492; Aden 122.
Kerosine, including jet fuel do	1,402	1,409	737	361	312	Iran 936; Bahrein 235; Netherlands West Indies 62.
Distillate fuel oil do	2,116	2,253	1,068	824	361	Iran 1,757; Bahrein 334; Italy 58.
Residual fuel oil do	3,837	3,806	3,060	696	50	Iran 3,088; Bahrein 694; Italy 23.
Liquid petroleum gas do	25	22	13	6	3	Aden 22.
Lubricating oil do	216	144	70	47	28	United Kingdom 78; United States 46.
Other oils do	15	13	9	2	1	Iran 6; United Kingdom 4; West Germany 1.
Grease, jelly and wax	2,591	2,482	1,397	615	470	United States 1,031; West Germany 537; Netherlands 240.
Asphalt, pitch, resins	23,656	15,907	10,113	4,929	865	Iran 9,338; Republic of South Africa 1,956; Trinidad 1,932.

[1] Data may not add to total shown due to rounding.
[2] Less than ½ unit.

Source: East African Common Services Organization (Nairobi, Kenya). East African Customs and Excise; Annual Trade Report of Kenya, Uganda, and Tanganyika, for Years Ended Dec. 31, 1962 and 1963.

COMMODITY REVIEW

Metals.—*Copper and Gold.*—The Macalder Nyanza copper mine near Lake Victoria was expected to close down gradually in 1965 when an effort would be made to establish gold production at Migori about 32 kilometers southeast of Macalder.

Platinum.—Johnson Matthey and Company of the United Kingdom investigated several areas of ultra-basic rocks that reportedly contain platinum. At yearend the company reportedly was active in western Sukulu province.

Mineral Fuels.—*Petroleum.*—Oil search in Kenya was suspended during the year. BP-Shell Petroleum Development Company of Kenya Ltd. (BP-Shell) ceased exploration and deep drilling until more security for its crews exists in the exploration area. Mehta Oil Exploration Co. surrendered its prospecting rights, reportedly because of a death in the family owning the company.

While the refinery at Mombasa of East African Refineries Ltd. actually went on stream in November 1963, it was opened officially on February 21, 1964. It represents the country's largest single investment since the building of the Kenya-Uganda railroad at the turn of the century.

Construction of the facility which cost nearly $16.8 million was begun in 1960 under an agreement between British Petroleum Co., Ltd., Shell Petroleum Co. Ltd., and the Kenya Government. Later Esso Standard Eastern Inc. and California Texas Oil Corp. also became participants in the venture. The plant was to supply petroleum products to all of East Africa, but Tanganyika (Tanzania) later signed an agreement with an Italian company for a refinery at Dar es Salaam.[10]

SOURCE MATERIALS

Principal sources for text were U.S. Embassy Nairobi, Kenya, Airgram A–862, May 28, 1965, and the annual review issue of the Mining Journal (London). The airgram was provided specifically for such use. Statistical tabulations were from official sources.

TANZANIA

In April 1964, Tanganyika and the island of Zanzibar united, becoming the United Republic of Tanganyika and Zanzibar. Later in the year the name of the country was changed to the United Republic of Tanzania.

Shortly after the change, the Ministry of Industries, Mineral Resources and Power was organized. The Ministry administers the mining laws of the country; in particular it grants and records prospecting and mining rights, collects mining rents and royalties, compiles mineral statistics, mine safety regulations, and regulates the handling and storage of explosives. The Geological Survey of Tanzania is a Division of the Ministry.

The value of Tanzania mineral production (exports and local sales) in 1964 was $24.8 million, equal to about 3.5 percent of the 1964 gross national product (GNP) of $715 million in current prices. The value was 22 percent higher than in 1963 and the alltime record for the country. As in previous years, diamond, gold, salt and tin accounted for the great bulk of the total value and contributed 77, 13, 4, and 4 percent, respectively, in 1964. The comparable figures for 1963 were 69, 18, 4, and 3 percent, respectively. The volume of diamond produced in 1964 was about 1 percent of world output exclusive of the U.S.S.R. The country's share of world output by value, however, was much larger. Gold production in 1964 was less than one-fourth of 1 percent of world output exclusive of Communist countries and 0.3 percent of total production in Africa.

With respect to contribution to foreign exchange earnings, mineral exports accounted for 12 percent of the value of all domestic exports in 1964 and for 11 percent in 1963.

Employment in mining industry continued the decline that began in 1961, partly because increasing average wage levels and increasing costs generally have required the industry to strive for greater efficiency and better use of labor. In 1963, the most recent year for which information was available, the average number of mining industry employees was 11,576, a 14.5 percent decrease from 1962 figures and 25 percent decrease from 1960 figures. In 1963 more than $5 million was paid in wages and salaries, of which nearly $3 million went to Africans. The extent to which wage rates for Africans have increased in recent years is shown below:

---

[10] The African-American Institute, Inc., Washington, D.C., U.S.A. Africa Report, v. 10, No. 4, April 1964, p. 25.

Company	Average monthly wages paid to Africans (dollars)		
	1961	1962	1963
Williamson Diamonds, Ltd	41.75	43.78	54.94
Three major gold mines	24.04	27.42	29.85
Other mining companies with more than 150 employees	20.70	24.83	29.07

It was believed a further increase in wage rates of about 10 percent occurred in 1964.[11]

During the year 11 geologists of the Geological Survey Division of the Ministry of Commerce and Industry and 6 members of the West German Geological Mission did systematic geological mapping, surveying about 40,000 square kilometers. Seven geologists conducted economic geological investigations. Occurrences of the following minerals were studied: Magnesite, kyanite, gypsum, corundum, kaolin, coal and semiprecious stones. In addition, numerous vein gold deposits were examined during a remapping of the North Mara and Musoma goldfields, where a United Nations exploration project will start in 1965.[12]

GOVERNMENT POLICIES AND PROGRAMS

The President presented to the National Assembly a 5-year development plan (1964–69) involving expenditures totaling nearly $700 million. The Central Government would spend $290 million, local authorities $28 million, the East African Common Services Organization $50 million, and the private sector of the economy $325 million. The major purposes of this plan and of two plans that follow are to raise annual per capita income from the present $54 to $126 by 1980; to make Tanzania fully self-sufficient in trained manpower; and to raise the life expectancy of the population from the present 35 to 40 years to 50 years.[13]

The plan includes the following projects involving mineral and mineral-based industry:[14]

---

[11] U.S. Embassy, Dar es Salaam, Tanzania. Department of State Airgram A–544, June 3, 1965.

[12] Commonwealth Geological Liaison Office. Newsletter for February–March 1965, p. 3.

[13] International Financial News Survey. V. 16, No. 20, May 22, 1964, p. 170.

[14] Tanganyika and Zanzibar Trade Journal (Dar es Salaam). No. 9, July–September 1964, p. 24.

Priority projects	Investment thousand dollars	Other projects	Investment thousand dollars
Caustic soda	140	Asbestos products	420
Cement and cement products	7,000	Construction materials	420
Coal mining and chemical complex [1]	14,000	Carbon dioxide	56
Fertilizers	1,400	Clay products	140
Glass manufacture	350	Copper sulfate	84
Iron ore mining [1]	14,000	Gypsum and products	420
Oil refinery	14,000	Metal manufactures	3,500
Steel reduction and rolling	11,200	Oxygen and acetylene	210
		Paints and varnishes	98
Total	62,090	Sulfuric acid	280
		Total	5,628

[1] Contingent on outcome of current investigation of coal and iron deposits and to some extent on new railroad construction.

According to the plan, the Government intends to participate in mining and mineral marketing by seeking minority shareholdings in such activities.[15] The Government already has a 50-percent interest in Williamson Diamonds Ltd., by far the largest mining operation in the country.

The policy of promoting Africanization of industry and trade to the maximum extent feasible was continued and perhaps intensified in 1964.

PRODUCTION

A 22-percent rise in value of production compared with 1963 (as measured by exports and local sales) was primarily due to an increase in the volume of diamond exports and higher prices realized for diamonds.

---

[15] The United Republic of Tanganyika and Zanzibar. Tanganyika 5-Year Development Plan, July 1, 1964–June 30, 1969. V. 2, p. 56.

TABLE 4.—Tanzania: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Copper,[1] content of lead concentrate	1,274	101	---	---	---
Gold [2] ......troy ounces	107,009	102,502	101,972	102,917	93,040
Lead, content of ore (exports)	6,284	351	---	---	---
Silver, exports ......troy ounces	614,279	64,144	23,959	22,669	25,329
Tin, content of ore, exports ......long tons	138	163	206	236	277
Tungsten, ore and concentrate, 60 percent WO_3, exports	---	3	---	---	---
Nonmetals:					
Artstone	---	8	5	[3] 502	457
Bentonite	100	249	---	---	5
Construction materials: [4]					
Clays	51,714	NA	NA	43,307	NA
Gravel	145,990	NA	NA	88,312	NA
Sand	209,202	NA	NA	136,059	NA
Stone	281,746	NA	NA	186,361	NA
Total	688,652	710,375	680,396	454,039	NA
Diamond:					
Gem ......carats	286,668	339,982	323,177	275,958	337,711
Industrial ......do	250,000	344,873	324,000	312,753	326,059
Gem stones, exclusive of diamond [5] ..kilograms	---	[6] 52.89	20.75	23.26	59.30
Graphite	24	---	---	---	---
Gypsum	4,728	640	2,007	r 1,894	2,957
Kaolin	223	155	159	182	111
Lime	3,694	3,524	2,296	r 1,260	2,169
Magnesite, export	114	43	---	85	495
Meerschaum	11	18	1	16	16
Mica, sheet	81	89	99	107	95
Salt ......thousand tons	35	33	30	34	33
Vermiculite	18	142	65	27	131
Mineral fuels:					
Coal, bituminous ......thousand tons	2	2	3	2	1

r Revised. NA Not available.

[1] Copper content of exports and local sales.

[2] Including gold in lead concentrates exported amounting to 8,963 ounces in 1960 and 521 ounces in 1961.

[3] Includes corundum.

[4] Reported in cubic feet; conversion factors were clay, 105 pounds per cubic foot; gravel, 100; sand, 90; stone, 100; and for 1961 and 1962 all 4 combined, 100.

[5] Includes ruby and sapphire; in addition there were 1,079 kilograms of chrysoprase reported in 1961; 363 kilograms of miscellaneous gem stones (including chrysoprase and zircon) in 1963 and 897 kilograms of miscellaneous gem stones in 1964.

[6] Includes 42.2 kilograms crude ruby; 6.35 kilograms rough ruby and sapphire; 4.33 kilograms ruby bearing corundum ore.

TRADE

On November 6 a total ban on trade with Portugal and its territories in Africa was declared officially. In making the announcement, the Minister for Commerce and Cooperatives said that the recent intensification of the freedom struggle in Mozambique and elsewhere demanded sterner measures (previously the ban had been unofficial).[16]

---

[16] Tanzania Trade Journal (Dar es Salaam). No. 10, October–December 1964, p. 29.

TABLE 5.—Tanzania (Tanganyika): Exports of metals and minerals to countries outside the East African Common Market

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Gold troy ounces	101,597	102,519	All to United Kingdom.
Iron and steel, scrap	NA	1,624	Japan 1,159; Netherlands 432.
Silver troy ounces	23,725	22,521	All to United Kingdom.
Tin, content of concentrate long tons	206	341	Malaysia 180; United Kingdom 149; Spain 12.
Tungsten, concentrate, 60 percent WO_3	--------	(1)	All to United Kingdom.
Nonferrous scrap	NA	387	Japan 108; Republic of South Africa 106; West Germany 72.
Nonmetals:			
Cement	10	1,224	Sudan 1,166.
Diamond:			
Gem carats	323,464	275,958	All to United Kingdom.
Industrial do	324,000	312,753	All to United Kingdom.
Gem stones, exclusive of diamond. £ sterling	6,250	34,858	United Kingdom 25,540; United States 5,000; West Germany 4,300.
Lime	118	48	All to Federation of Rhodesia and Nyasaland.
Mica	99	109	United Kingdom 70; United States 29.
Salt:			
Curing and agriculture	--------	361	Burundi 303; Republic of the Congo (Léopoldville) 58.
Other	9,809	12,394	Burundi 9,756; Republic of the Congo (Léopoldville) 2,398.
Sand	--------	8	All to ships stores.
Stone, dimension	2	--------	
Crude minerals, not elsewhere specified. £ sterling	191	2,755	Netherlands 1,300; West Germany 627; United States 260.

[1] 272 kilograms.

Source: East African Common Services Organization (Nairobi, Kenya). East African Customs and Excise; Annual Trade Report of Kenya, Uganda and Tanganyika, for Years Ended Dec. 31, 1962 and 1963.

COMMODITY REVIEW

Metals.—*Gold.*—The value of gold production was $3.27 million in 1964 compared with $3.61 million in 1963. A major objective of the United Nations exploration project will be to revitalize Tanzania's fading gold mining industry.

Tin.—Exports of tin concentrate increased in 1964 for the fifth successive year, reaching 396 long tons valued at $885,000, compared with 197 tons valued at $307,000 in 1960. The extent to which the 1964 increase may have represented concentrates entering Tanzania illegally from Rwanda is not known. Such traffic existed in 1963.

Nonmetals.—*Cement.*—The Tanganyika Portland Cement Co. was building a $4.9 million cement plant near Dar es Salaam scheduled for completion by the end of 1965. Initially the plant will manufacture 130,000 tons of cement annually. Limestone for the facility will come from a nearby deposit of coral origin containing sufficient material to last the plant 100 years.[17]

Diamond.—The 664,031 carats of diamonds exported in 1964 by Williamson Diamonds Ltd., the only diamond producer in Tanzania, were provisionally valued at $19 million, compared with $14 million for 571,632 carats exported in 1963. The average price realized per carat was $28.56 in 1964 compared with $23.38 in 1963.

The Williamson diamond pipe (called Mwadui pipe) at the surface has the largest area of any workable pipe known, covering 1.4 square kilometers (347 acres). A program to explore the pipe at depth was begun in 1958 and was nearing completion in 1964. Close to the pipe a shaft was sunk to a depth of 366 meters and the pipe was explored at depths of 37, 61, 91, and 366 meters. In all, more than 15,000 meters of drifts and crosscuts were driven and sampled. Sampling results below the 37-meter level were disappointing.[18]

---

[17] Tanganyika and Zanzibar Trade Journal (Dar es Salaam). No. 9, July–September 1964, p. 19.

Williamson is owned equally by the Tanzania Government and De Beers Consolidated Mines Ltd., which operates the property and markets output. In August the Government decided to break away from De Beers diamond marketing organization in order to further the efforts of the Organization of African Unity to promote a boycott of the Republic of South Africa.[19]

Mineral Fuels.—*Petroleum.*—Late in the year a petroleum refinery was under construction on a 113-hectare (280-acre) site near Dar es Salaam. The main contractors for the $14 million facility are SNAM Divisione Progretti of Milan, Italy. Annual crude capacity will be 600,000 tons.[20]

After many years of work in the Tanzania area the British Petroleum Company Ltd., decided that further exploration was not justified.[21]

SOURCE MATERIALS

A major source for the Tanzania section of this chapter was Department of State Airgram A–544, June 3, 1965, of the U.S. Embassy in Dar es Salaam, furnished specifically for preparing this section. Other major sources were the Mining Journal (London) and publications of the Ministry of Industries, Mineral Resources and Power, of Tanzania. Statistics were from official sources of the Tanzania Government.

UGANDA

Copper mining was the backbone of Uganda mineral industry in 1964, as for several years past. Primarily because of increased copper output and higher copper prices, the industry established a new record for value of production. The value of mineral exports probably was also a new record. The production value was nearly 4 percent of the country's 1964 gross domestic product of $590 million in current prices.

Four Ugandans received scholarships from Kilembe Mines Ltd. to take a 3-year diploma course in mining engineering at Ghana's Tarkwa School of Mines. The men are expected to work for Kilembe Mines upon their return from Ghana. The students are the third group to take the course; the other groups consisted of two students each. The General Secretary of the Uganda Mine Workers' Union at Kilembe issued a statement thanking the company for sending the

---

[18] Tanganyika and Zanzibar Trade Journal (Dar es Salaam). No. 8, April–June 1964, p. 22.

[19] Mining Journal (London). Mining—Annual Review 1965. May 1965, p. 197.

[20] Tanzania Trade Journal (Dar es Salaam). No. 10, October–December 1964, p. 29.

[21] British Petroleum Company Ltd. (London). Annual Report for 1964, p. 24.

Ugandans to the school. He stressed the importance of training Ugandans for managerial or administrative posts.[22]

In area A, Karmoja, the Uganda Geological Department continued the geological and geochemical followup in United Nations aerial survey areas, with assistance from the Canadian Government. Area C/D was opened to prospecting during the year.

A team from the U.S.S.R., including specialists in geology and various industries, visited Uganda to survey projects that might be suitable for Soviet aid.

For 1963 the Acting Commissioner of Mines reported in July 1964.[23] A Canadian technical assistance adviser was rewriting the Mining Laws of Uganda. In its report published in October 1961 the World Bank had recommended employment of an expert to simplify the Mining Ordinance and Regulations and to make recommendations on mining policy, legislation and taxation. A total of $26,460 was collected in royalties payable under the Mining Ordinance. Total labor employed in mining was 6,191 persons, of whom 5,827 were Africans, and expenditures on African wages totaled $1.5 million (£539,109). Average basic wages per month paid to Africans were as follows, by mining districts: Kigezi $6.11; Angole $6.32; Toro $28.79. The large-scale operator, Kilembe Mines Ltd., is the employer in Toro district; in the other districts employers mostly operate on a small and primitive basis. At yearend Mines Department senior staff had been reduced by two inspectors and mining wardens and comprised one acting commissioner, one inspector and one inspecting surveyor.

GOVERNMENT POLICIES AND PROGRAMS

In 1964 the Government continued to pursue its policy of Africanization of industry, retail establishments, and business generally to the maximum extent possible.

Uganda has a 5-year development plan (1962–66), which aims to increase national income by 5 percent each year. Although funds have been available, prosecution of the plan has been somewhat restricted by difficulties in obtaining necessary manpower and other resources. In 1964, $27.4 million was authorized but only $19.6 million was spent.[24]

During the year, the Uganda Parliament passed a Foreign Investors Protection Act providing protection of approved foreign investments against expropriation without adequate compensation and insuring transfer out of Uganda of profits and the principal and interest on loans.[25]

PRODUCTION

The preliminary value of 1964 mineral production was $22.7 million.[26] Compared with 1963 figures, the volume of blister copper produced increased 14.2 percent and the value about 70 percent. Cement, apatite, and tin production also rose.

---

[22] U.S. Embassy, Kampala, Uganda. Department of State Airgram A-303, Jan. 29, 1965.
[23] Uganda Government. Annual Report of the Mines Department, 1963.
[24] U.S. Embassy, Kampala, Uganda. Department of State Airgram A-331, Feb. 26, 1965.
[25] U.S. Embassy, Kampala, Uganda. Department of State Airgram A-325, Feb. 29, 1965.
[26] Mining Journal (London). Mining-Annual Review, 1965. May 1965, p. 193.

TABLE 6.—Uganda: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Beryl	426	1,031	[r] 1,012	380	[1] 408
Bismuth, metal content ... kilograms	1,650	650	50	[r] 30	[e] 30
Columbium-tantalum concentrates ... do	2,370	7,366	13,087	9,000	[p] 3,954
Copper, blister	14,748	13,374	[r] 15,579	[r] 16,216	18,520
Gold (exports) ... troy ounces	744	453	412	16	----------
Lithium minerals (amblygonite)	----------	23	20	48	[1] 20
Silver (exports) ... troy ounces	109	70	[r] 38	9	----------
Tin, content of concentrate ... long tons	32	33	[r] 69	[r] 163	213
Tungsten concentrate, 60 percent WO_3 basis (exports)	76	220	95	2	19
Nonmetals:					
Cement ... thousand tons	72	63	56	55	[e] 55
Lime ... do	15	14	16	11	[p] 12
Mica, splittings ... kilograms	----------	386	83	----------	----------
Phosphate (apatite)	4,073	401	[r] 1,123	7,072	[e] 11,000
Salt ... thousand tons	5	7	3	3	[p] 3

[e] Estimate. [p] Preliminary. [r] Revised.
[1] Exports.

TRADE

Mineral exports in 1964 were provisionally valued at $18.1 million to which blister copper contributed $17.4 million and tin concentrates $608,000. The comparable figures for 1963 were $10.9 million, $10.4 million and $415,000, respectively.

Uganda has a consistently favorable balance of trade with countries outside the East Africa Common Market (EACM, which is one of Uganda's major contributions to the market. In 1964 (January to November) the balance was unusually favorable, amounting to $89.9 million ($56.3 million for January to November 1963). Exports outside East Africa totaled $169.4 million, to which copper exports contributed 9 percent, ranking third after coffee (56 percent) and cotton (25 percent) for export earnings. Imports in 1964 (January to November) were valued at $79.5 million, about $280,000 less than in the same 11 months of 1963. Items of which marked increases in value of imports occurred, included tractors, machinery, and trucks.

TABLE 7.—Uganda: Exports of metals and minerals, to countries outside the East Africa Common Market

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Beryl	1,081	346	NA.
Copper, blister	15,788	15,565	West Germany 7,219; Netherlands 2,936; Belgium 1,879; Italy 1,513.
Gold ... troy ounces	412	16	All to United Kingdom.
Tin, concentrate ... long tons	87	230	United Kingdom 207; Spain 23.
Tungsten, concentrate	--------	6	All to United Kingdom.
Other ores and concentrates of base metals, unspecified.	996	400	United States 298; Japan 102.
Nonmetals:			
Asbestos	89	81	Aden 37; Zanzibar 21; Sudan 19.
Cement	737	--------	
Lime	4	--------	
Salt	671	574	Rwanda 340; Republic of the Congo (Léopoldville) 234.

NA Not available.

Source: East Africa Common Services Organization (Nairobi, Kenya). East African Customs and Excise; Annual Trade Report of Kenya, Uganda, and Tanganyika, for Years Ended Dec. 31, 1962 and 1963.

Uganda's ban on trade with the Republic of South Africa appeared to have been effective in 1964. Even exposed photographic film addressed to or coming from South Africa was confiscated.[27]

COMMODITY REVIEW

Metals.—*Copper.*—Kilembe Mines Ltd. continued to be Uganda's sole copper producer. In 1964 the company enjoyed the most successful year in its 8-year history, establishing new records for earnings and tonnage of blister copper produced. The following are some highlights of the operation in 1964 compared with 1963 figures which are given in parentheses.[28] Output of blister was 18,259 tons (16,216); metal sales were $17.8 million ($10.4 million); operating profit and net earnings were $8.6 million ($2.9 million) and $3.9 million ($343,380), respectively; earnings per share were $0.99 (6.5 cents); average copper selling price per pound was 43.7 cents (29.3 cents).

The company estimated ore reserves (proved and probable) at yearend at 6.2 million tons averaging 2.02 percent copper.

Labor turnover continued to decrease and there was a further increase in the length of service of employees, but a shortage of competent labor and qualified technical personnel still existed. Government agencies cooperated fully with the company in its training program for Africans. Intertribal fighting occurred twice in the vicinity of company properties, but it was promptly quelled by police and army units.

Kilmex Ltd., a Kilembe Mines subsidiary, planned to spend $100,000 on prospecting for copper and other base metals in an area south of Lake George and east of Kilembe Mine.

Iron and Steel.—The Steel Corporation of East Africa, which began production in June 1963, at yearend had 275 employees and had planned annual production of 25,000 tons. Its output includes reinforcing bars, rolled steel angles and plates, nails, steel welded mesh, hoop iron for building, and copper plated wire. A small factory in Mombasa producing bolts and nuts was purchased and eventually will be moved to Jinja where it will be operated in conjunction with the steel plant. The corporation also planned to manufacture barbed wire.

Tin.—Production of tin concentrate increased as a result of the sharp rise in world tin prices. Many small tin mines employing an estimated 1,300 persons were operating in the western region of Uganda, and Kilembe Mines Ltd. began to exhibit interest in tin mining possibilities. The company reportedly was investigating tin occurrences in the Ankole Kingdom of Uganda.[29]

Nonmetals.—*Fertilizer Materials.*—During the year a team of technical experts from Imperial Chemical Industries Ltd. (ICI) of the United Kingdom investigated economic possibilities for exanding fertilizer plants in Uganda. Although interest centered on the superphospate plant of the Uganda Development Co. Ltd. at Tororo, which is administered by Twiga Industries of the ICI group of companies, a full investigation was being carried out, including establishment of a nitrogenous fertilizer plant. East Africa has been importing annually about $500,000 worth of nitrogenous fertilizer whereas potential consumption is much larger. At Tororo the team also discussed increasing the capacity of the Tororo Industrial Chemicals and Fertilizer plants, which has had an annual superphosphate capacity of 25,000 tons.[30]

---

[27] U.S. Embassy, Kampala, Uganda, Department of State Airgram A–331, Feb. 26, 1965.

[28] Values, reported in Canadian currency, have been converted at the rate of Can$1=US$0.925.

[29] U.S. Embassy, Kampala, Uganda. Department of State Airgram A–299, Jan. 29, 1965.

SOURCE MATERIALS

Major sources for the Uganda section of the chapter were dispatches of the U.S. Embassy in Kampala, Uganda, the Mining Journal (London), and the annual report for 1964 of Kilembe Copper Cobalt Ltd., Toronto, Ontario, Canada. The Mining Journal (London) was the major source of production satistics.

---

[30] East African Trade and Industry. November 1964.

The Mineral Industry of Liberia

By Benjamin H. Lim [1]

◆

THE mineral industry of the Republic of Liberia continued to be dominated by the production of iron ore, which accounted for 96 percent of the value of mineral output in 1964. The remainder consisted of construction materials and diamond and gold. The outstanding event in the country's mineral industry during 1964 was initiation of mining of the vast iron ore deposits at Mount Nimba by Liberian American Swedish Minerals Co., which became by far the largest producer of ore in Liberia by producing about 6.5 million tons of ore during its first year of operation. Another major mineral industry event during the year was the signing of a $200 million agreement between the Liberian Government and the Kitoma Mining and Trading Co. for the exploitation of an iron ore deposit at Mount Kitoma.

Liberia's mineral exports reflected the country's production. Iron ore export in 1963 amounted to $45 million compared with $32.4 million in 1962, and constituted almost 90 percent of the country's total value of mineral exports. Domestic consumption of mineral products, as reflected by the country's imports during 1963, consisted mainly of semimanufactured and finished aluminum and iron and seel products, cement, and mineral fuels. Total mineral imports during 1963 were valued at $14.2 million compared with $17.0 million in 1962. The decrease was chiefly due to the curtailed imports of iron and steel semimanufactures which totaled $9.8 million in 1962—about $6.9 million more than the 1963 figure.

GOVERNMENT POLICIES AND PROGRAMS

In January, the Liberian chief of Geological Surveys submitted a proposed 5-year program (1964–69) to the Director of the Bureau of Natural Resources and Survey for an intensive geological inventory of the country. The program included detailed mappings of prospects, construction of chemical and petrographic laboratories to facilitate geological research, establishment of training programs for native field foremen and geological assistants, and provision of specialized educational opportunities for staff geologists.

During 1964, Liberia's Geological Survey's activities were centered around implementation of a geological mapping program jointly set up by the Bureau of National Resources and Surveys and a United States Agency for International Development (AID) mission to Liberia. Under other Liberian Government programs, geological mapping was carried out in the area between Monrovia and Mount Coffee, the site of the proposed hydroelectric dam, as well as in parts of Bopolu District and Loffa County.[2]

---

[1] Physical scientist, Division of International Activities.

PRODUCTION

With the initiation of full scale operation of the huge iron ore installation of the Liberian American Swedish Minerals Co. (LAMCO), Liebria became the largest iron ore producer in Africa and one of the major world producers. Output of iron in 1964 was nearly double that of 1963. The 1964 gold production, as indicated by sales through official channels, was about 250 troy ounces less than the 1963 output. Recorded diamond exports, used as a measure of production, were 177,000 carats less in 1964 than in 1963, chiefly because of a slackening in production or in unrecorded imports of the industrial type.

TABLE 1.—**Liberia: Production of metals and minerals**

Commodity[1]	1960	1961	1962	1963	1964
Metals:					
Gold[e] .... troy ounces..	1,119	2,088	2,184	1,960	1,824
Iron ore .... thousand metric tons..	3,051	3,251	3,607	[2] 6,557	10,457
Nonmetals:					
Diamond:[2]					
Gem .... carats..	577,000	596,000	224,715	[3] 239,556	298,367
Industrial .... do....	400,000	500,000	680,000	[3] 507,865	272,499
Total .... do....	977,000	1,096,000	904,715	[3] 747,421	570,866

[e] Estimate.
[1] In addition to commodities listed, simple construction materials were also produced, but no record of output is available.
[2] Exports.
[3] Year ended Aug. 31, 1963.

TRADE

Total value of Liberia's 1963 mineral exports was approximately $50.1 million compared with $37.0 million in 1962. Of the 1963 total, $45.0 million was accounted for by iron ore ($32.4 million in 1962), comprising about 90 percent of the total value of mineral exports. The only other significant mineral export of the country was diamond, the values of which aggregated $3.1 million in 1962 and $5.0 million in 1963. Small quantities of gold produced in Liberia and very modest mineral reexports accounted for the balance of Liberia's mineral exports. Since 1961, export earnings by iron ore have outpaced Liberia's traditional leading export item, crude rubber. The foreign exchange earnings of rubber during 1962 and 1963 were $25.7 and $23.9 million, respectively. The combined value of iron ore and rubber represented 93 and 91 percent, respectively, of the total values of exports for those years.

Mineral imports totaled $14.2 million in 1963, and $17.0 million in 1962. Metal imports, chiefly aluminum and iron and steel semimanufactured, amounted to $2.9 million in 1963, compared with $9.8 million in 1962. Value of nonmetals, mainly cement and allied construction materials, increased from $2.9 million in 1962 to almost $3.8 million in 1963. Mineral fuel imports, consisting predominantly of refined petroleum products, increased from $4.3 million in 1962 to $7.5 million in 1963. Mineral imports constituted only 17 and 21 percent, respectively, of the total values of imports for 1962 and 1963.

---

[2] Bureau of Natural Resources and Surveys. Monrovia. The Republic of Liberia. Annual Report. Aug. 31, 1964. 33 pp.

TABLE 2.—Liberia: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Iron and steel:			
Iron ore and concentrate thousand tons	3,801	6,458	West Germany 1,682; United States 1,432; United Kingdom 1,095; Netherlands 886.
Semimanufactures	9	----------	
Zinc, semimanufactures	2	----------	
Nonmetals:			
Cement	1,648	33	Guinea 24; West Germany 8.
Diamond carats	854,587	746,459	Belgium-Luxembourg 454,725; United Kingdom 180,089; Netherlands 79,616.
Mineral fuels:			
Petroleum refinery products:			
Gasoline 42-gallon barrels	501	38	Sierra Leone 32; Ivory Coast 6.
Kerosine do	103	----------	
Lubricating oils and greases	5	860	Ghana 854; Sierra Leone 6.
Liquefied refinery gas	----------	6	Ghana 4; United States 2.

Note: All items, except iron ore and concentrate, are reexports.

TABLE 3.—Liberia: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and aluminum alloys:			
Unwrought	(1)	4	Mainly from United States.
Semimanufactures	478	275	Sweden 151; United Kingdom 39; United States 24.
Copper, unwrought and semimanufactures.	136	130	United States 49; Italy 36; United Kingdom 16.
Iron and steel:			
Pig and sponge iron	----------	[2] 128,945	Belgium-Luxembourg 73,098; United States States 22,342; Lebanon 20,332.
Ingots, blooms, slabs, billets, etc.	222	----------	
Joists, girders, angles, shapes, etc.	2,599	296	Sweden 260; West Germany 27; East Germany 6.
Bars and rods	352,432		
Plates and sheets	2,865	1,410	Japan 521; West Germany 435; United Kingdom 139.
Hoops and strips	228	25	United States 12; Belgium-Luxembourg 10; West Germany 3.
Rails and railway track material.	34,489	4,183	West Germany 3,972; United States 96; Sweden 90.
Wire rods	25	65	West Germany 27; United States 14; Canada 7.
Tubes, pipes, fittings, etc	4,366	4,568	West Germany 2,057; United States 914; France 449.
Castings and forgings	60	141	United States 75; Sweden 16; Belgium-Luxembourg 15; United Kingdom 14.
Lead and alloys, all forms	129	347	Japan 203; Belgium-Luxembourg 52; West Germany 33.
Nickel, unwrought and semimanufactures.	99	21	West Germany 17; United Kingdom 2; Belgium-Luxembourg 1.
Tin, unwrought and semimanufactures. long tons	13	8	West Germany 5; United States 2.
Zinc, unwrought and semimanufactures.	3,695	2,826	Japan 1,814; Belgium-Luxembourg 361 United States 295; West Germany 199.
Other nonferrous metals and alloys.	303	13	Sweden 5; United Kingdom 5.

See footnotes at end of table.

TABLE 3.—Liberia: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals:			
Asbestos	7	71	Italy 27; Lebanon 17; West Germany 12.
Abrasives (grinding wheels, cloth, paper, etc.).	3,150	83	West Germany 44; United States 25; Sweden 4.
Cement ... thousand tons	67	89	Poland 26; West Germany 20; Sweden 12; Belgium-Luxembourg 10.
Construction materials of asbestos, cement, etc.	3,188	2,113	Belgium-Luxembourg 573; Italy 535; West Germany 318; United States 190.
Clays	801	4	West Germany 2; United Kingdom 2.
Fertilizers, crude and manufactured.	14	1,041	West Germany 673; Morocco 258; Macao 23.
Lime	813	768	Sweden 526; Netherlands 79; West Germany 61.
Salt, table and rock	3,407	6,776	West Germany 5,739; United Kingdom 608.
Sand and gravel	----------	65	Belgium-Luxembourg 45; Italy 14.
Stone:			
Dimension, including slate	560	509	Italy 401; Belgium-Luxembourg 47.
Other	213	160	Italy 104; United Kingdom 26; Spain 18.
Mineral fuels:			
Coal, coke and briquets	4	43	West Germany 29; Sweden 12,
Petroleum:			
Crude ... 42-gallon barrels	79	[2] 4,154	United States 19.
Refinery products:			
Gasoline ... thousand 42-gallon barrels.	159	617	Venezuela [e] 400; United States 136.
Kerosine ... do	65	92	United States 28; Venezuela [e] 19.
Gas-diesel oil ... do	424	1,349	Venezuela [e] 1,000; United States 310.
Lubricating oil, greases, etc. ... do	30	[3] NA	Venezuela [e] 45; United States 6.
Other oils	7	56	
Petrolatum	105	107	United States 97.
Asphalt, etc	157	758	United Kingdom 385; United States 309.

NA Not available.
[e] Estimate.
[1] Less than ½ unit.
[2] Presumed to be in transit shipment.
[3] Included with other oils.

Source: Export and import data books for 1962 and 1963. Bureau of Statistics. Republic of Liberia.

The total foreign trade deficit was $64.0 million in 1962, but only $26.9 million in 1963, a decrease of 58 percent. The improvement in the balance resulted from increased exports, and from substantial cutbacks in imports of machinery and transport equipment, manufactured goods, and crude and semimanufactured metal and nonmetal products. There were, however, increases in imports of mineral fuels and related products, food, and selected manufactured articles.

COMMODITY REVIEW

METALS

Gold.—There was no improvement in gold mining during 1964. Hand placer mining methods continued to be used and accurate production figures were not available. During the Liberian fiscal year ending August 31, 1964, 1,824 troy ounces were sold to the Bank of Monrovia for about $64,000, but quantities of gold sold to goldsmiths, jewelers, and others were not recorded.

Iron Ore.—As a result of the opening of the Mount Nimba iron mine, Liberia exported 11.4 million tons of iron ore during the Liberian fiscal year ending August 31, 1964, compared with 4.5 million tons in the previous fiscal year. Ore exports for the 1964–65 period were expected to climb to 13.5 million tons. By yearend 1964, three companies were producing ore, a fourth has completed its installations, and a fifth firm was initiated.

TABLE 4.—Liberia: Shipments of iron ore by companies for the fiscal period September 1, 1963, through August 31, 1964

(Metric tons)

Company and country of destination	Fines	Lumps	Total
Liberia Mining Co.:			
United Kingdom	618,733	163,421	782,154
Netherlands	538,403	147,073	685,476
United States	49,492	360,219	409,711
West Germany	213,085	93,426	306,511
Other countries	35,348	170,117	205,465
Total	1,455,061	934,256	2,389,317
National Iron Ore Co.:			
Netherlands	473,052	428,285	901,337
United Kingdom	312,330	418,409	730,739
France	328,823	94,645	423,468
West Germany	198,719	35,176	233,895
Other countries	34,800	242,357	277,157
Total	1,347,724	1,218,872	2,566,596
Lamco J.V. Operating Co.:			
United States	-----	2,611,069	2,611,069
Netherlands	-----	1,965,046	1,965,046
West Germany	-----	675,620	675,620
Belgium	-----	664,434	664,434
Other countries	-----	559,785	559,785
Total	-----	6,475,954	6,475,954
Grand total	2,802,785	8,629,082	11,431,867

Liberia Mining Co., Ltd. (LMC) iron ore exports in 1964 decreased 484,000 tons compared with its 1963 level, principally because of the unavailability of freighters and production curtailment as a result of the rainy season. The company made a few investigations for additional ore deposits to increase its reserves at the Bomi Hills mine, but results were unfavorable. In 1964, the company entered a contract with the Congress of Industrial Organizations (CIO); one of the provisions of the contract called for a 5-day 8-hour week replacing the 6-day 10-hour week. Other provisions stipulated transportation of workers to and from work, and various improvements in worker housing facilities.

National Iron Ore Co., Ltd. (NIOC), operating firm for the Mine Management Associates, Ltd., was able to increase exports in 1964 by 1.1 million tons over that of 1963, as a result of considerable improvements in operating facilities made during the year. Additional equipment has been ordered to further improve and expand the operations. Exports of the company for the 1964–65 period are expected to total about 3 million tons dependent upon the availability of ships. Steps were taken in 1964 to improve the settling of silt to prevent the pollution of the Mano River.

At the Liberian American Swedish Minerals Co. (LAMCO) newly inaugurated Mount Nimba facilities about 6.4 million tons of ore was produced in 1964 and about 8 million tons output was expected in 1965. Of the estimated reserve of about 300 million tons of hematite, about 200 million tons are in the so-called Main Orebody which extends

1,800 feet below the highest outcrop. One of the major difficulties encountered in putting the mine into operation was the heavy average rainfall, of some 180 inches annually.

In the dry state the ore assayed: Iron, 67.1 percent; phosphorus, 0.048 percent; silicon dioxide, 0.49 percent; alumina (Al_2O_3), 1.56 percent; sulfur, 0.005 percent; copper, 0.001 percent; arsenic, 0.003 percent; chromium, 0.004 percent; and ignition loss, 1.9 percent. The moisture content in the discharge ports averaged 7.6 percent.[3]

German-Liberian Mining Co. (DELIMCO), Liberia's fourth major iron ore operation, at the Bong Range deposits, was completed in late 1964, about 1 year ahead of schedule. The deposit, estimated to contain 300 million tons of ore containing 40 percent iron, had been developed by a West German consortium comprising five prominent industrial organizations: August-Thyssen-Hutte, Dortmunds-Horder-Hutteunion, Rheinstahl, Phoenix-Rheinrohr, and Bochumer-Verein. The Italian national steel firm, Finsider, also had a financial interest. The ore will be concentrated in Humphreys spirals and magnetic separators to a 66-percent concentrate, and initially 3 million tons of this concentrate will be shipped annually from the Bong Range to West German furnaces. Expansion of annual output to 5 million tons was planned.[4] The ore will be shipped by a new railroad to the port of Monrovia for export. Under the terms of the concession agreement with the Liberian authorities, half the profits earned from mining the Bong iron ore will go to the Liberian Government.

In September 1964, an agreement calling for the expenditure of $200 million to put Liberia's fifth iron ore project into operation was approved by President Tubman. Under the agreement the Liberian Government, the Liberian Mining Co., and the Kitoma Mining and Trading Co. will jointly undertake a project in the Kitoma Mountain area. The Kitoma reserve has been conservatively estimated at 750 million tons containing 40- to 60-percent iron.[5]

The Kitoma Mining and Trading Co. is affiliated with the Hanna Mining Co. and Landberg, Thalman and Co., a New York banking firm. An article in a Liberian press stated that one of the provisions of the concession agreement gave the Liberian Government 1 million Class A shares, and that 1 million Class B shares will be divided as follows: 225,000 shares to Kitoma and 775,000 shares to U.S. interests.

NONMETALS

Diamond.—The Liberian diamond industry saw no major changes in 1964. The mining of diamond continued in Loffa and Nimba counties, but output, although not recorded, is known to have been very small. The substantial exports recorded in recent years have been chiefly diamond which have entered Liberia from adjacent countries, mainly Sierra Leone and Guinea, for sale to buyers in Monrovia.

During September 1, 1963—August 31, 1964, approximately 677,000 carats were reportedly exported by Monrovia diamond buyers, a decrease of 70,421 carats from that of the corresponding previous

---

[3] Annual Report, 1963. The Grängesberg Co., Stockholm, Sweden. 1964. 32 pp.

[4] Mining Journal. Liberia. Fourth Iron Ore Producer. V. 263, No. 6743, Nov. 13, 1964, p. 353.

[5] Africa Report. V. 9, No. 10, November 1964, p. 22.

12 months. Value of the 1964 exports was about $4.08 million against $4.25 million in 1963. Total royalty to the Government, however, increased from $665,000 to $683,000. The increase was attributed to a gain of $50,000 from granting of diamond export licenses, the price of which went from $2,500 to $10,000 per year effective January 1, 1964. The following official data are for exports by Monrovia diamond buyers during the Liberian fiscal year ended August 31, 1964.

TABLE 5.—Liberia: Salient diamond industry statistics for the fiscal period September 1, 1963 through August 31, 1964

Company	Number of shipments	Borts, industrials, etc.		Gem, cuttables, etc.		All stones		
		Quantity (carats)	Value (dollars)	Quantity (carats)	Value (dollars)	Quantity (carats)	Value (dollars)	Royalty paid (dollars)
Aihaji M. Iorah and Goldberg Diamond Co	33	103,562	171,642	77,507	1,125,145	181,069	1,296,787	194,518
Maubak Diamonds Co	10	44,394	58,028	20,173	191,025	64,567	249,053	37,358
Matton Diamonds Co	12	102,305	181,084	37,374	540,272	139,679	721,356	108,204
Diamond Import-Export Co	22	83,239	145,640	44,174	639,898	127,413	785,538	117,831
Liberian Diamimpex Co	13	22,034	35,422	35,486	315,923	57,520	351,345	52,702
Liberian European Diamond Trading Co	9	17,265	31,493	16,150	229,231	33,415	260,724	39,109
Eurafric Diamond Co	13	30,964	42,633	24,602	282,267	55,566	324,900	48,735
Diamstone Diamond Co	1	6,220	12,992	796	11,792	7,016	24,784	3,718
Gafrodian Diamond Co	3	7,108	14,702	3,082	51,177	10,190	65,879	9,882
Liberia Swiss Mining Corp	3	158	264	404	3,275	562	3,539	531
Special permit	1	--------	--------	3	344	3	344	34
Total	120	417,249	693,900	259,751	3,390,349	677,000	4,084,249	612,622
Total for 7 dealers' license fees	--------	--------	--------	--------	--------	--------	--------	70,000
Total government intake for fiscal 1964	--------	--------	--------	--------	--------	--------	--------	682,622

Note: The official values shown on which royalty is computed are ⅙ of the price paid by buyers.

Source: Bureau of Natural Resources and Surveys, Monrovia, Republic of Liberia.

Explosives.—In April 1964, West African Explosives and Chemicals, Ltd. (EXCHEM), first plant in West Africa to produce blasting agents, began production in a new installation on a 1,200-acre concession between Harbel and Marshall, about 5 miles from Robertsfield International Airport. Average monthly output was initially set at 117 tons each of "Hydromex" and "Amex". The former explosive is a slurry type blasting agent consisting essentially of NH_4NO_3, $NaNO_3$, and coarse hydrated TNT particles, while the latter consists of NH_4NO_3, oil, and wood pulp.

The owners of EXCHEM are J. M. Baerd of the Baerd Chemical Co. of New York (40 percent), Canadian Industries, Ltd. (35 percent), and various Liberians (25 percent). In Liberia, EXCHEM is the exclusive supplier to the iron ore mining firms and most of the construction companies. EXCHEM has also exported some of its products to Mauritania. When full production gets underway in a few years, the firm is expected to export its products to Nigeria, Ghana, Ivory Coast, and Sierra Leone.

The concession under which the company operated included these rights granted to the firm by the Liberian Government: (1) exclusiveness with respect to explosives manufactures during the first 10 years of operation, (2) exemption from income tax for 5 years, (3) exemption from public highway funds levy, (4) exemption from tariffs on any import or export of needed raw materials, equipment and supplies including explosives and accessories; provided, however, that the exemptions are only for company's suppliers and customers. On its part EXCHEM agreed in part (1) to train Liberians in every phase of the company's operations and (2) to grant at least two foreign scholarships each for 4 years for study of chemistry or chemical engineering; thus, undertaking to continue for the life of the company.

MINERAL FUELS

Crude Petroleum.—New arrangements were made for the Liberia Refining Co., a subsidiary of Dynalectric Corp. The projected refinery at Monrovia will be operated by the company's parent firm rather than by one of the Hunt's interests as was reported earlier. The plant has been scheduled to go on production in 1966 with an initial annual capacity of 500,000 tons of crude.

The Mineral Industry of Libya

By William C. Henkes[1]

◆

THE economy of Libya continued to be dominated by the production and export of crude petroleum. During 1964, total exports amounted to $709 million; crude petroleum accounted for $693 million.[2] With imports of $292 million, Libya had a favorable trade balance of $416 million for the year. The rate of growth of exports is illustrated by the fact that petroleum exports for the last quarter was 19.8 percent higher than in the third quarter.

Libya's 1964 daily average petroleum production of about 865,000 barrels ranked the country seventh among free world oil producing countries. The estimated oil reserves of 9,000 million barrels was slightly over 2.5 percent of the world's estimated reserves.[3] Libyan oil is of particular importance in the world energy balance because of the country's proximity to Europe. The short haul across the Mediterranean to western European pipeline terminals and even the longer tanker trips to the United Kingdom and northwest European ports give this crude oil a definite cost advantage over oil from the Middle East; the basic tanker rate from Marsa el-Brega to Hamburg is $3.62 per ton compared with $6.96 per ton from Ras Tanura, Saudi Arabia, to Hamburg.[4] Libya in 1964 provided 28 percent of the crude oil imports of West Germany and about 16 percent of those of the United Kingdom.

The oil industry directly employed over 12,600 people including about 9,000 Libyans, roughly 8 percent of the nonagricultural labor force.

GOVERNMENT POLICIES AND PROGRAMS

Because of the favorable trade balance resulting from crude oil exports, the Government in late 1964 reduced customs tariffs on over 300 items, mostly on essential consumer goods. The strong foreign exchange holdings also led to a public announcement that, because of the country's solvency and to avoid paying interest abroad, no foreign borrowing would be allowed without permission of the Bank of Libya.

A major development of great potential value to the mineral industry was the publication of a geologic map of Libya. The map, at a scale of 1:2,000,000, was prepared by the U.S. Geological Survey under the U.S. Agency for International Development program.

---

[1] Petroleum engineer, Division of International Activities.

[2] Monetary conversions made at the rate of US$1=L£0.357.

[3] Oil and Gas Journal. V. 62, No. 52, Dec. 28, 1964, pp. 106–107.

[4] Lichtblau, J. H. Oil in the North African Economy. Preprint of lecture at 18th Annual Conference, Middle East Institute, Washington, D.C., May 8–9, 1964.

PRODUCTION

Mineral production was dominated by petroleum output, which has risen from 6.5 million barrels in 1961, when production began, to 316 million barrels in 1964.

No statistical data are collected on minerals other than petroleum and solar salt and gypsum, which are produced by Government agencies. The gypsum plant became operative in August 1964 and produced about 400 tons valued at about $2,240 during the balance of the year.

The Geological Division of the Ministry of Industry estimated that more than 300 quarries produced building stone, and that at least 7 quarries and plants produced crushed rock for concrete and road aggregate.

TABLE 1.—Libya: Production of minerals [1]

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Nonmetals:					
Brick ... thousand bricks	10,800	11,000	11,000		NA
Gypsum					400
Lime	17,000	18,000	19,800	NA	NA
Natron	100	1,000	1,000	NA	5
Salt ... thousand tons	14	11	16	19	13
Stone, crushed [2] ... do	250	250	250	NA	NA
Mineral fuels:					
Natural gas ... million cubic feet					[3] 231,236
Petroleum, crude ... thousand 42-gallon barrels		6,642	67,052	[r] 167,786	[r] 315,660

[r] Revised. NA Not available.

[1] Data are approximate except for petroleum.

[2] Includes gravel.

[3] Estimate based on 4th quarter gas production.

TRADE

Libya achieved a favorable trade balance for the first time in 1963; this has been continued in 1964. In 1963, the last year for which final detailed trade statistics are available, total exports were valued at $373.4 million of which petroleum accounted for 98.7 percent; imports were $238.8 million, for a balance of $135.1 million. Imports by oil companies declined slightly from $69.5 million in 1962 to $68.2 million in 1963, but overall imports increased 16 percent. In 1963, exports other than petroleum decreased 16 percent, but overall exports increased 172 percent.

In 1963, Italy and the United States vied for first place as a source of Libyan imports with 20.5 percent and 19.9 percent, respectively, of the total imports; followed by the United Kingdom (17.8 percent) and West Germany (12.6 percent). The United Kingdom took the largest share of the country's exports (28.0 percent), followed by West Germany (25.2 percent), and Italy (14.7 percent); the United States was in sixth place with 5.2 percent.

TABLE 2.—Libya: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Scrap, ferrous and nonferrous	3,557	7,757	Italy 7,647.
Nonmetals:			
Salt	30		
Sulfur		22	All to Syrian Arab Republic.
Mineral fuels:			
Petroleum, crude thousand 42-gallon barrels	59,505	167,015	United Kingdom 47,305; West Germany 42,612; Italy 23,839; France 20,443; Netherlands 13,125.

Source: Ministry of National Economy, External Trade Statistics.

TABLE 3.—Libya: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum	228	307	Italy 212; United Kingdom 39.
Copper	61	104	Italy 61; Belgium 20.
Iron and steel:			
Pipes, tubes, and fittings	98,077	86,973	West Germany 29,147; Italy 19,335; United Kingdom 12,192; United States 11,636.
Other forms	20,443	32,502	West Germany 8,061; Belgium 7,319; Soviet bloc 1,719; United States 705.
Lead	40	152	Netherlands 108.
Nickel		6	All from United Kingdom.
Silver, platinum, and other platinum group metals troy ounces	86,775	89,345	West Germany 35,591; United Kingdom 27,328.
Tin and tin alloys long tons	6	33	United Kingdom 15; Netherlands 11.
Zinc	259	364	Belgium 222.
Undifferentiated, including slag, dross, and similar waste	129	409	Greece 407.
Nonmetals:			
Abrasives	(1)	4	Italy 2; West Germany2.
Asbestos, friction material	851	223	Soviet bloc 142
Cement thousand tons	241	288	Rumania 103; other Soviet bloc 67; Greece 32.
Clays	(1)	27,428	Greece 14,389; Italy 10,842.
Fertilizers, mineral	17,166	15,308	Italy 7,463; West Germany 4,760.
Lime	9,743	15,603	Italy 13,432; Rumania 1,890.
Salt	20	61	United Kingdom 58.
Stone, sand, and gravel	12,391	NA	
Sulfur	(1)	7	All from Belgium.
Other	15,392	3,539	Italy 2,169.
Mineral fuels:			
Asphalt, natural	(1)	3,553	Italy 2,699.
Coal and coal products	6,180	8,561	United States 8,541.
Petroleum, refinery products:			
Gasoline thousand 42-gallon barrels	567	644	France 272; United States 235.
Kerosine and jet fuel do	180	229	France 119; United States 73.
Distillate fuel do	672	765	United States 291; France 244.
Residual fuel do	49	118	France 71; United States 29.
Lubricants do	49	59	United States 23; France 16.
Asphalts, wax, bitumen do	90	63	Italy 41; Albania 18.
LP gases do	19	67	Italy 32; France 23.
Total do	1,626	1,945	

NA Not available.

[1] Not listed separately in 1962.

Source: Ministry of National Economy, External Trade Statistics.

COMMODITY REVIEW

NONMETALS

Cement.—The Libyan National Cement Co. sold substantial shares of its stock to the Libyan Government in order to finance the construction of a 100,000-ton-per-year cement plant at Homs, Tripolitania. Such a plant could further improve Libya's favorable trade balance; imports of cement in 1963 were 288,000 tons valued at $3.8 million.

It was reported that United States Steel International was considering the erection of a clinker grinding plant near Benghazi at which clinker from its Bahamas plant would be processed and special cements produced for the oil industry.[5]

Gypsum.—The Government-owned gypsum plant near Tripoli was completed early in 1964, and a management contract for its operation was awarded to a British firm.

Potash.—The 15,000-hectare potash concession near Marada, about 70 miles south of El Agheila in Cyrenaica, held by Homestake Mining Co. and Cabeen Exploration Ltd., was being explored by the operators. Earlier estimates indicate reserves of about 1.6 million tons of 40 percent K_2O equivalent and 7.5 million tons of $MgCl_2$.[6]

MINERAL FUELS

Petroleum.—Petroleum continued to be Libya's predominant mineral resource. Production in 1964 increased 88 percent over 1963 output, reflecting the completion of additional pipelines and port facilities during the year. Exports of crude petroleum were 313,409,000 barrels valued at $693 million based on an average posted price of $2.21 per barrel.[7] By December 1964, only 3 years after exports started, both production and exports had reached an average of one million barrels per day. In 1964, West Germany displaced the United Kingdom as the principal destination for Libyan crude oil, receiving 106.4 million barrels, compared with 70.6 million barrels for the United Kingdom and 37.1 million barrels for Italy.

Late in 1964, Esso Standard Libya, Inc. (Standard Oil Co. (N.J.)), announced plans for establishing natural gas liquefaction facilities at its petroleum terminal at Marsa el-Brega. The plant will process gas associated with the crude oil from Esso's fields, which will then be transported in liquid form in special tankers to markets in Italy and Spain. Plans call for selling about 300 million cubic feet of gas per day.

Exploration and Development.—The pace of 1964 drilling operations increased by 18 percent over that of 1963 with a total of 422 wells completed; of these 229 (54 percent) were completed as oil wells and 193 were dry holes. No data are available as to classification of these wells (exploratory or development) nor to the number of successful wells in the two categories. In 1963, however, this breakdown was as follows:

---

[5] U.S. Embassy, Tripoli, Libya. Airgram A–411, June 12, 1964, p. 4.
[6] Engineering and Mining Journal. V. 165, No. 6, June 1964, p. 312.
[7] Ministry of Petroleum Affairs. Monthly Crude Production.

Drilling activity 1963 [1]

	Oil	Gas	Dry	Total	Success ratio (percent)
Exploratory wells	58	1	186	245	24
Development wells	98	0	15	113	86
Total	156	1	201	358	44

[1] Moody, J. D. Petroleum Developments in Africa in 1963. Bull. American Association of Petroleum Geologists, v. 48, No. 10, October 1964, p. 1650.

Of the wells drilled in 1963, 68 percent were exploratory. This ratio probably increased in 1964 as operators tried to evaluate their concession holdings before having to reduce each of them to one-third of their original size in accordance with Libyan laws; this reduction must be made by the 10th year of the concession, and the earlier concessions were granted in 1955. Eight holes have been drilled in the five offshore concessions, one of which was drilled in 315 feet of water, a record depth for the Eastern Hemisphere.

Development drilling also increased because pipeline outlets reached additional fields and pipeline capacities were enlarged.

Geological and geophysical activity decreased slightly as this phase of exploration was completed on the older concessions and no new concessions were available for additional work. By mid-1964, 20 companies held 95 concessions covering slightly less than 50 percent of the area of Libya. On these concessions, some 77 separate geologic structures had been found productive of oil and/or gas; some of these will undoubtedly prove to be uneconomic, and some will prove to be parts of common reservoirs. At the end of 1964, nine fields were producing oil and gas.

TABLE 4.—Libya: Production of crude oil and natural gas, 1964

Field	Concession	Structure (operators designations)	Crude oil, thousand 42-gallon barrels	Natural gas, million cubic feet [1]
Zelten	6	C	149,270	109,764
Raguba	20	E	26,657	27,510
Dahra	32	B & F	45,695	48,856
Sawah	59	L & V	14,077	1,368
Zaggut	59	M	2,344	476
Waha	59	A	46,517	22,444
Gialo [2]	59	E	9,658	242
Hofra	11	A	16,658	20,150
Beda	47	B	4,784	426
Total			315,660	231,236

[1] Estimated from 4th quarter production data. This gas is flared or used for field fuel.

[2] Gialo field began production Oct. 4, 1964.

Source: Ministry of Petroleum Affairs. Monthly Crude Production.

Refineries.—The Esso Sirte Inc. 8,000-barrel-per-day refinery at Marsa el-Brega remained shut down pending agreement between the company and the Libyan Government on prices for the refinery products. Two portable refineries were in use in Libya supplying fuels for field operations: one with a crude capacity of 400 barrels per day is in British Petroleum Exploration Co. (Libya) Ltd. Nelson Bunker Hunt's Sarir field in Concession 65; and the other, with a capacity of 2,400 barrels per day, is used by Oasis Oil Co. Libya Inc. (owned equally by Amerada Petroleum Corp., Continental Oil Co., and Marathon Oil Co.) in its Waha field (Concession 59).[8]

Pipelines.—Late in 1964, two additional pipeline systems became operative to heighten the country's productive capacity. In October, Oasis opened its 160-kilometer, 30-inch extension from the Waha to Gialo fields, and in November, Mobil/Amoseas, owned by Socony Mobil Oil Co., Inc. and American Overseas Petroleum Ltd. (Texaco, Inc. and Standard Oil Co. of California), started delivery of oil through its 30-inch and 24-inch lines from the Beda, Ora, and Hofra fields to the new shipping port at Ras Lanuf. The Libyan Government also approved plans by British Petroleum-Hunt to build a 530-kilometer, 34-inch oil pipeline from its Sarir field in Concession 65 to the deep-water port of Tobruk; this line is planned for completion in September 1966 and will have an initial capacity of 100,000 barrels per day and an ultimate capacity of nearly one million barrels per day.[9]

Port and Storage Facilities.—In mid-1964, the Esso petroleum port of Marsa el-Brega had 16 floating-roof storage tanks of 268,000-barrel capacity each. Loading facilities included four berths; one for tankers up to 36,000 tons and loading at the rate of 15,000 to 16,000 barrels per hour; one for 50,000-ton tankers loading 18,000 barrels per hour; one for larger tankers loading at 40,000 barrels per hour; and one located a mile offshore that was designed for bow-mooring any size tanker now in use and had a loading capacity of 40,000 barrels per hour.

The port at Ras es-Sidr, built and operated by Oasis Oil Co., had eight 313,000-barrel storage tanks in use, three under construction in late 1964, and two more planned. Its three deep-water loading berths had average loading capacities of 32,000 barrels per hour with a maximum of 42,000 barrels per hour.

In November 1964, Mobil Oil (with its minority partner, Gelsenberg Benzin A.G.) and Amoseas opened Libya's third petroleum port at Ras Lanuf, a few kilometers east of Ras es-Sidr. The port has three 500,000-barrel, floating-roof storage tanks with two more under construction. It had two loading berths offshore each supplied by 40-inch submarine lines.[10]

In connection with its pipeline being built from the Sarir field, British Petroleum-Hunt planned to build a petroleum shipping port at Marsa el-Hariga, in the sheltered harbor at Tobruk in northeastern Cyrenaica.

---

[8] Oil and Gas International. V. 4, No. 11, November 1964, p. 43.
[9] Oil and Gas Journal. V. 62, No. 29, July 20, 1964, pp. 43–44.
[10] Oil and Gas Journal. V. 62, No. 49, Dec. 7, 1964, p. 122.

The Mineral Industry of The Malagasy Republic

By Arthur P. Nelson[1]

⁂

MALAGASY Republic remained predominantly agricultural in 1964. Although its resources of high-quality graphite are large, the Republic's production and exports of this commodity declined sharply because of increased competition from other sources; the 13,173 metric tons produced in 1964 constituted about 2.9 percent of the total world production of graphite for that year. The Republic also continued to make important contributions to French requirements of uranothorianite, quartz crystal, and monazite. Although preliminary data indicate that the value of mineral exports in 1964 was 8.4 percent greater than in 1963, the foreign exchange earned by these exports was only about one-fourth the cost of Malagasy's imports of mineral commodities in 1964.

An important development during the year was construction at Tamatave of the country's first oil refinery; upon completion in 1966, this refinery's planned capacity of 12,000 barrels per day is expected to supply all the liquid fuel requirements of the Malagasy Republic.

GOVERNMENT POLICIES AND PROGRAMS

A Malagasy-U.S.S.R. trade agreement was signed in October 1964. Malagasy's trade with the U.S.S.R. since the former's independence has been very limited and was carried on without the benefit of any trade agreement. The October agreement was for a period of 3 years and was automatically renewable for a second period of 3 years unless notice to terminate would be given by either of the parties 6 months prior to expiration date. The agreement provides that payments arising from trade between the two countries and all other payments will be made in freely convertible currency in conformance with exchange regulations of each country.

Annexed to the agreement were two lists of products to be exchanged, but no quantities or values were indicated. Malagasy exports included a wide range of commodities but, of its exportable mineral production, only quartz and mica were specifically listed. Russian exports range from matches to roadbuilding equipment with heavy emphasis on machinery. Included in the list of Soviet exports was mining and drilling equipment. By means of annual protocols, the lists of commodities may be revised and adjusted; and if the need arises, reciprocal quotas may be assigned.

---

[1] Physical science administrator, Division of International Activities.

Soviet exports to Malagasy, like those of all countries not members of the French franc zone or the Common Market, will continue to fall within and will be chargeable against Malagasy's global import quota. Also, Soviet exports to Malagasy will continue to be subject to customs duties from which the franc zone and Common Market countries are exempt.

Decisions taken by the Malagasy Republic's Council of Ministers on November 18, 1964, following an International Colloquium on Industry held at Antsirabe in October, resulted in the formulation of a new industrialization policy. The new policy was reported to be based on two principles—coexistence between socialism and private investment and progressive Malagasization of industry. The policy was presented in two parts: (1) Delimitation of sectors and (2) ways and means of implementation.

Under the delimitation of sectors, the three sectors of industry defined by the policy were: (1) the reserved sector; (2) the sector with priority for socialization; and (3) the free sector.

The reserved sector was set aside exclusively for the Government. Except for certain State monopolies, this sector comprised key industries on which the Government wants to confer a public service character in accordance with its socialistic option. These industries included the exploitation of national energy resources (coal, oil, natural gas, and hydroelectric resources); production and distribution of electrical energy; and rail, maritime, and air transportation. Coastal shipping was excluded from the reserved sector. Within the reserved sector, the State may operate enterprises itself or it may grant concessions to operating companies; in the latter case, the State will generally have financial interest in the company.

The sector with priority for socialization included all industries engaged in the first stage processing of agricultural products.

The free sector encompasses all industries not included in the foregoing two sectors. Both Malagasy and foreign private investors are invited to invest in this sector and will be accorded all privileges and benefits provided for in the Investment Code. Although private entrepreneurs reportedly are to be free to establish industries without participation by Société Nationale d'Investissement (SNI), there are certain instances in which such participation will be permitted. SNI may associate with private Malagasy investors when these investors lack sufficient capital and with private foreign investors to assure partial Malagasization of their industries, or it may establish industries itself as a "national promoter."

PRODUCTION

Significant developments were the sharp increases in the production of uranothorianite and the severe decreases in output of graphite and beryl. Productive capability was not a technical factor in these decreases; however, production of graphite in Malagasy was affected adversely by increased competition from other sources of supply and the decrease in production of beryl resulted from lower world prices.

TABLE 1.—**Malagasy Republic: Production of metals and minerals**

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Beryl	636	758	674	411	212
Chromite	------	10,500	18,454	11,200	11,770
Columbium and tantalum ... kilograms	10,115	21,206	9,400	17,200	3,600
Gold ... troy ounces	273	347	325	900	440
Manganese ore	------	300	------	------	------
Monazite	427	456	637	615	964
Nickel ore [1]	------	2	100	14,388	NA
Titanium concentrate (ilmenite)	2,729	3,302	3,184	3,653	4,900
Uranium ore and concentrate [1]	511	410	544	482	690
Zirconium ore and concentrate	340	320	354	388	512
Nonmetals:					
Feldspar	------	13	------	------	(2)
Garnet, industrial	------	50	100	2	65
Graphite	14,445	14,944	17,485	19,245	13,173
Mica (phlogopite):					
Block	116	101	82	97	93
Splittings	895	908	1,261	868	589
Phosphate rock	4,630	------	------	------	------
Quartz crystal ... kilograms	11,100	17,850	13,300	28,700	28,300
Salt [e]	17	17	17	17	17
Stones, semiprecious ... kilograms	24,492	12,201	762	4,159	3,831
Mineral fuels: Coal (bituminous) ... tons	------	2,000	------	------	400

[e] Estimate. NA Not available.

[1] Exports.

[2] Less than ½ unit.

TRADE

Available data on Malagasy's trade in mineral commodities during 1964 are preliminary but despite the apparent sizable increase in total value, no major changes in the pattern of trade distribution were evident. The following tabulation indicates the relative position of mineral commodities in Malagasy's total trade:

	Value of mineral commodities (thousand dollars)	Mineral commodity share of total trade (percent)
Exports:		
1962	4,284	4.5
1963	3,729	4.5
1964	[p]4,781	[p]5.7
Imports:		
1962	16,069	13.2
1963	18,026	14.1
1964	NA	NA

[p] Preliminary. NA Not available.

TABLE 2.—Malagasy Republic: Exports of metals and minerals

(Metric tons)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Beryl	725	227	United States 225.
Chromite	19,007	13,000	All to France.
Columbite-tantalite	7	27	United States 25.
Copper, scrap	336	134	West Germany 96; France 21.
Iron and steel scrap	111	2,736	Japan 2,666.
Lead, scrap	10	3	All to France.
Nickel ore	100	14,388	NA.
Thorium minerals [1]	951	1,127	All to France.
Zircon	3	----------	
Other [2]	63	----------	
Nonmetals:			
Cement	8	4	Australian area of Antarctica 3.
Garnet, industrial	77	1	Mainly to France.
Gem stones, semiprecious	5	17	France 15.
Graphite	16,463	15,797	United States 4,813; United Kingdom 3,383; France 3,325; West Germany 2,143.
Mica	1,086	842	United States 243; France 166; West Germany 162.
Quartz, crystal	[r] 27	43	Mainly to France.
Other	2	7	Do.
Salt	1,332	2,407	Réunion 1,874; Comoro Islands 521.

[r] Revised.

[1] May include some uranothorianite as well as monazite.

[2] Includes some titanium minerals.

Source: République Malagache, Ministère des Finances. Statistiques du Commerce Exterieur de Madagascar (Foreign Commerce Statistics of Madagascar). 1962, 502 pp.; 1963, 585 pp.

TABLE 3.—Malagasy Republic: Imports of major metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum	200	252	France 216.
Copper	236	177	France 171.
Iron and steel:			
Pig iron and ferroalloys	23	22	All from France.
Scrap	93	3	Do.
Blooms and slabs	2	(1)	Do.
Rolled steel	29,919	40,847	France 38,406; Belgium-Luxembourg 795.
Lead	147	195	France 191.
Nickel	2	(1)	All from France.
Tin ... long tons	11	31	France 29.
Zinc	134	89	Belgium-Luxembourg 45; France 44.
Nonmetals:			
Abrasives, natural	18	18	France 15; West Germany 3.
Blocks, paving	419	15	All from France.
Boron minerals	1	(1)	Do.
Cement	103,768	84,232	France 62,448; Belgium-Luxembourg 7,362; Republic of South Africa 5,091; Israel 5,070.
Chalk	47	116	All from France.
Clays	29	110	France 85; Algeria 25.
Fuller's earth	3	1	Mainly from France.
Gypsum, calcined	1,143	2,194	All from France.
Lime	2,428	2,761	Mainly from France.
Magnesium carbonate, natural	3	5	France 4; West Germany 1.
Mica	8	1	All from France.
Mineral pigments	136	178	Do.
Salt	3,476	535	West Germany 335; France 191.
Sulfur	3	19	All from France.
Talc	9	3	Do.
Mineral fuels:			
Coal and briquets	5,417	14,524	Republic of South Africa 11,889; Rhodesia and Nyasaland 2,006; former British East Africa 630.
Coal byproducts	38	33	All from France.
Coke and semicoke	47	43	Do.
Mineral tar	39	53	Do.
Petroleum refinery products:			
Gasoline	59,918	61,830	Iran 38,628; Arabian countries 16,225.
Kerosine	17,995	18,459	Iran 16,876.
Diesel oil	46,991	51,199	Iran 40,796; Arabian countries 9,391.
Fuel oil	1,239	1,544	Arabian peninsula 1,272; Iran 110.
Lubricants	5,846	6,450	France 3,094; United States 2,035.
Liquefied petroleum gas (LPG)	1,298	1,331	Arabian countries 1,282.
Asphalt, bitumen, and petroleum coke.	3,734	5,628	Republic of South Africa 2,869; Iran 2,343.
Other	846	792	Indonesia 679.
Total	137,867	147,233	

[1] Less than ½ unit.

Source: République Malagache, Ministère des Finances. Statistiques du Commerce Exteriour de Madagascar (Foreign Commerce Statistics of Madagascar). 1962, 502 pp., 1963, 585 pp.

COMMODITY REVIEW

METALS

Bauxite.—Péchiney, Compagnie de Produits Chimiques et Électrométallurgiques continued prospecting activities in the Manantenina district; bauxite reserves in this area reportedly totaled about 70 million tons.

Beryl.—A severe drop in price caused a sharp curtailment in mining of beryl in 1964. Production decreased to only 52 percent of the 1963 output, 212 tons. Exports totaled 142 tons, thus increasing the apparent unsold stocks of mined beryl by 254 tons since 1962.

Chromite.—Although output increased slightly (570 tons), to 11,770 tons in 1964 as compared with the 1963 production, exports decreased 22 percent, to 10,114 tons, during the same period. Details are lacking but apparently most, if not all, of the output was from the Ranomenia mine, about 37 kilometers north of the port of Tamatave, operated by Société d'Électro-Chimie, d'Électro-Métallurgie et des Aciéries Électriques d'Ugine (UGINE). Continued exploration in the Andriamena region by UGINE reportedly resulted in a considerable increase in reserves of chromite in that area above the 2 million to 3 million tons previously estimated.

Monazite.—The trend of increased output of monazite was sharply accelerated in 1964 when production increased to 964 tons, an increase of about 57 percent over 1963 output. The upsurge resulted from increased production at the Isandravinang plant of the Establissements Tricot. Output of this plant, north of Manantenina, has reportedly exceeded that of the plant near Fort-Dauphine operated by the Société de Traitement des Sables du Sud de Madagascar (SOTRASSUM).

Titanium and Zirconium Concentrates.—Production statistics showed a marked increase in output of these commodities, probably reflecting the increase in production of monazite. However, the absence of reported exports indicated that these concentrates were still being stockpiled in 1964. SOTRASSUM reportedly had plans to market part of its ilmenite production when port facilities at Fort-Dauphine have been improved.

Uranothorianite.—Production and exports of uranothorianite reached a new peak in 1964 and became Malagasy's leading mineral commodity in terms of value. No production statistics are available for 1964 but the magnitude of production is indicated by the volume of exports which has closely paralleled production.

	Production (metric tons)	Exports (metric tons)
1961	409	410
1962	504	544
1963	481	482
1964	NA	690

NA Not available.

The steady rise in production of uranothorianite since first exploited in 1954 is attributable to expanded operations of the Betioky plant of the French Atomic Energy Commission. The uranothorianite is mined from deposits within pyroxenites which are widely distributed in Fianarantsoa Province in the extreme south of the island. The host rock contains about 0.3 to 0.4 percent uranothorianite as an accessory mineral. The uranothorianite concentrate produced on jigs and tables contains from 18 to 23 percent U_3O_8 and about 60 percent ThO_2. The total output of uranothorianite was exported to France.

NONMETALS

Graphite.—Competition from other sources of supply caused a decline in production of graphite from 19,245 tons in 1963 to 13,173 tons in 1964, thus erratically disturbing a long established upward trend in production and dropping graphite to the position of second most important mineral commodity, in terms of value, after uranothorianite. Exports also declined from the preceding year but exceeded production by 1,145 tons, causing a modest decrease of accumulated stocks. All production was from seven operations in the area of established productivity west and southwest of Tamatave, whose productive potential far exceeds current export requirements.

Mica.—In terms of value, mica (phlogopite) was Malagasy's third most important mineral product after uranothorianite and graphite in 1964. Although production decreased, total exports of all types increased considerably and included waste products for which a stronger demand developed during the latter part of the year; consequently the total value of all types of mica exported increased from about $935,000 in 1963 to $1,020,000 in 1964. A merger of two companies, the Société des Minerais de la Grande Ile and the Société des Minas d'Ampandrandava, and absorption by this merged organization of mines of the Establishments W. Boetschi, created a new group which represents about 96 percent of the total mica production in Malagasy.

MINERAL FUELS

Coal and Lignite.—Despite the existence of large reserves of noncoking bituminous coal in the Sakoa coalfield [2] and lignite in the Sambiana Basin,[2] the increasing demand for solid fuels in the Malagasy Republic was met by imports. Total production in 1964 was 400 tons of coal, whereas imports of coal and briquets in 1963, the latest year for which import data are available, totaled 14,524 tons.

Petroleum.—Malagasy had no crude petroleum production and the country remained dependent upon imports throughout the year. All exploration was by the Société des Pétroles de Madagascar (SPM), which is owned jointly by the Malagasy Government, the French Bureau de Recherches de Pétrolières, and other metropolitan French interests. SPM continued exploration in the Majunga basin with 10 party months of surface and 5 party months of seismic investigations; no work was done in the Morondara basin during 1964.

SPM was granted an exploration permit for an area of about 100,000 square kilometers and bid on another lease covering both onshore and offshore areas near Bombetoka.

The island's first refinery was under construction at Tamatave by yearend and was scheduled to go on stream in 1966 with a capacity of 12,000 barrels per day. The cost of the refinery ($8.3 million) is to be met by SPM (35 percent), the Malagasy Government (15 percent), and several established marketing companies in Malagasy (50 percent); the latter includes two U.S. companies, Esso International, Inc. and Caltex Oil Co.

---

[2] Murdock, Thomas G. Mineral Resources of the Malagasy Republic. Bu. Mines Inf. Circ. 8196, 1963, 147 pp.

The Mineral Industry of Morocco

By Arthur P. Nelson[1] and Walter A. Hayden[2]

❖

IN 1964 Morocco's mineral output increased in contrast to the decline in many other sectors of the nation's economy. Total value of minerals produced rose to $174 million,[3] 22 percent more than in 1963, and constituted about 7.4 percent of the gross national product. Mineral exports, valued at $169 million, accounted for 37 percent of the country's total exports.

A salient feature in Morocco's mineral industry was the 18-percent increase in mine production of phosphate rock to a record level of nearly 10.1 million tons; with the increase, Morocco retained its position as the world's second largest producer after the United States, accounting for about 17 percent of world output. Preliminary and incomplete data for 1964 indicate that Morocco also retained its position as the world's foremost exporter of phosphate rock, accounting for about one-fifth of the world total. Less significant to world supply, but important to Morocco's economy, was the production of 1,678 metric tons of cobalt in concentrates and 341,000 tons of manganese ore, constituting about 13 percent and 2 percent, respectively, of total world production.

Production of 21,220 tons of pyrite in 1964 reversed an upward trend during which production rose from 13,438 tons in 1960 to 23,142 tons in 1963. Output of antimony and zinc increased in response to improved world prices. Production of lead remained fairly stable while the output of iron ore, anthracite, and crude oil declined.

The number of workers employed in the minerals industry increased slightly in 1964 to an average of nearly 31,000, or about 1 percent of the total labor force. Relations between labor and management were generally good in the mineral industry; the only major disruption was a 2-week strike of petroleum workers in October.

Construction of the chemical complex at the port of Safi was nearing completion at yearend, and operations were scheduled to begin by mid-1965.

GOVERNMENT POLICIES AND PROGRAMS

No significant changes were made during 1964 in Government policies or laws regarding the minerals industry. Against the existing background of governmental control over companies or organizations accounting for over 80 percent of the country's mineral production, a law was proposed by an opposition deputy in Parliament to nationalize the mining industry; at yearend the proposed law had not been placed on the agenda for official consideration.

---

[1] Physical science administrator, Division of International Activities.

[2] Second Secretary, U.S. Embassy, Rabat.

[3] Where necessary, values have been converted from dirhams (DH) at the rate of DH5.06=US$1.

The drafting of a major program in the form of a 3-year plan (1965–67) was nearing completion at yearend. Although the plan focused development efforts primarily on tourism, agriculture, and the formation of trained labor cadres, it included development projects for potash deposits near Khemisset, east of Rabat, for fluorspar deposits at El Hamman, southwest of Meknes, and for the Moulouya lead deposits near Midelt.

The Moroccan Office Cherifienne des Phosphates (OCP) and the Algerian Ministry of Economy reportedly concluded an agreement in principle whereby a proposed ammonia plant at Argew, northeast of Oran in Algeria, will sell ammonia to the Safi chemical complex. An estimated 50,000 tons will be required annually.

Following conferences in Jordan and Morocco, Office des Producteurs de Phosphates was formed by authorities in Morocco, Tunisia, and Jordan to coordinate their countries sales of phosphates on the international market.

PRODUCTION

The major developments during 1964 were the recordbreaking production of phosphates and the progress made on the OCP's expansion program, which aims at increasing phosphate production at the rate of an average of 1 million tons a year for the next 7 years. Although the output of several major minerals was lower than in 1963, the substantial increases in production of phosphates, antimony, cobalt, and zinc, coupled with improved world prices for antimony, lead, zinc, and copper, resulted in a 22-percent increase in the value of minerals production to a total of $174 million; of this total value, phosphate rock accounted for 66 percent, or about $115 million.

TABLE 1.—Morocco: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Antimony, content of concentrate	325	368	407	[r] 675	1, 559
Cobalt, content of concentrate	1, 271	1, 290	1, 436	1, 371	1, 678
Copper, mine	1, 260	1, 737	[r] 2, 497	[r] 1, 806	1, 595
Gold, troy ounces	104	136	NA	NA	NA
Iron ore, thousand tons	1, 577	1, 462	1, 149	1, 035	888
Lead:					
Mine	94, 750	88, 268	90, 104	[r] 73, 972	70, 430
Smelter	30, 727	24, 488	[r] 24, 143	[r] 18, 760	18, 839
Manganese ore	483, 084	571, 084	469, 357	334, 948	341, 078
Nickel, content of cobalt ore	254	258	287	274	305
Silver, thousand troy ounces	[r] 1, 097	908	[r] 826	772	604
Tin:					
Mine, long tons	10	11	10	[r] 10	13
Smelter, do	10	10	10	[r] 10	10
Zinc, mine	49, 169	40, 779	34, 420	[r] 33, 038	43, 500
Nonmetals:					
Barite	84, 318	82, 183	89, 793	94, 554	89, 844
Cement, thousand tons	580	630	698	[r] 759	828
Clay, smectic	37, 672	38, 603	32, 639	37, 367	32, 289
Fluorspar	----------	788	495	6, 350	6, 570
Fuller's earth	3, 750	2, 298	2, 898	2, 959	4, 305
Gypsum [e]	25, 000	25, 000	25, 000	[r] 30, 000	30, 000
Ochre	1, 411	1, 541	1, 237	869	864
Phosphate rock, thousand tons	7, 472	7, 950	8, 162	8, 548	10, 098
Pyrites, including cupreous pyrites	13, 438	14, 077	[r] 20, 745	23, 142	21, 220
Salt, thousand tons	30	21	28	37	61
Mineral fuels:					
Coal, anthracite, do	412	410	370	404	400
Fuel briquets, do	23	24	23	18	18
Natural gas, marketed, million cubic feet	352	299	[r] 278	[r] 372	436
Petroleum:					
Crude, thousand 42-gallon barrels	695	603	968	1, 140	910
Refinery products:					
Gasoline, do	642	592	1, 821	2, 189	1, 442
Kerosine, do	80	122	541	602	490
Fuel oil:					
Distillate, do	319	435	2, 246	2, 457	2, 187
Residual, do	242	347	1, 511	1, 933	2, 345
Other, do	285	333	233	457	[e] 712
Total, do	[1] 1, 633	[1] 1, 907	[1] 6, 557	7, 638	[e] 7, 176

[e] Estimate. [r] Revised. NA Not available.

[1] Includes refinery fuel and losses, which are not listed separately in detail.

TRADE

In 1963, the last year for which complete Moroccan trade statistics were available, the trade balance for mineral commodities was favorable to Morocco by about $108.2 million, compared with an overall unfavorable trade balance of $59.4 million. The following tabulation compares 1963 data with those of 1962:

	Value (million dollars)		Minera commodities' share of total trade (percent)
	Mineral commodities	All commodities	
Exports:			
1962	132.9	348.3	38.1
1963	137.0	383.9	35.7
Change, 1962 to 1963	+4.9	+35.2	−3.4
Imports:			
1962	28.2	425.0	6.6
1963	28.8	443.3	6.5
Change, 1962 to 1963	+0.6	+18.3	−0.1
Trade balance:			
1962	+104.7	−76.7	XX
1963	+108.2	−59.4	XX

XX Not applicable.

Phosphate rock was again the most important mineral commodity exported in terms of earnings, accounting for 66.6 percent of all mineral export value in 1963; petroleum imports were the most significant major class of all mineral imports, accounting for 45.9 percent of total mineral import value in 1963. The following tabulation shows the percentage of total export and import values accounted for by major commodities and commodity groups:

Commodity group	Percent of total value			
	Exports		Imports	
	1962	1963	1962	1963
Metals:				
Ferrous	7.9	7.1	16.1	13.8
Nonferrous	23.4	22.5	17.3	25.2
Total	31.3	29.6	33.4	39.0
Nonmetals:				
Phosphate rock	64.8	66.6		
Other	1.9	1.7	9.4	9.2
Total	66.7	68.3	9.4	9.2
Mineral fuels:				
Petroleum	.2	.1	52.5	45.9
Other	1.8	2.0	4.7	5.9
Total	2.0	2.1	57.2	51.8

Comparison of preliminary data on 1964 exports of mine and smelter products (excluding some less important commodities) with 1963 data for the same commodities indicates an overall increase in the value of exports; these data for 1964 follow:

Commodity	Quantity (metric tons)	Value (thousand dollars)
Phosphate rock	10,041,000	$114,556
Lead:		
Concentrate	81,710	13,653
Metal	17,357	5,654
Total	XX	19,307
Manganese ore:		
Chemical grade	64,590	4,005
Metallurgical grade	266,400	6,134
Total	XX	10,139
Iron ore	1,062,942	8,823
Zinc concentrate	74,279	7,251
Cobalt concentrate	14,601	1,876
Coal (anthracite)	130,413	1,630
Copper concentrate	4,727	1,034
Barite	91,582	970
Antimony ore	1,608	359
Other [1]	XX	3,474
Grand total	XX	169,419

[1] Includes iron oxide, pyrites, goethite, silver, smectic clay, fuller's earth, and fluorspar.
XX Not applicable.

The total value of commodities, $169 million, is almost $24 million more than the total value of exports of the same commodities in 1963.

TABLE 2.—Morocco: Exports of major metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals: [1]			
Aluminum: [2]			
Scrap	681	476	Italy 424; Belgium-Luxembourg 18.
Other	83	76	France 51.
Antimony ore	1,014	1,349	Spain 600; France 300; Belgium-Luxembourg 198; United Kingdom 150.
Cobalt ore	11,443	16,712	France 10,304; mainland China 4,000; Belgium-Luxembourg 2,408.
Columbium-tantalum ore	----------	400	All to France.
Copper:			
Ore	5,458	6,620	Poland 4,010; West Germany 864; Sweden 810 Spain 478.
Scrap [2]	697	755	West Germany 248; Italy 207; Belgium-Luxembourg 199.
Other [2]	266	215	Italy 180; Belgium-Luxembourg 35.
Iron and steel:			
Iron ore ---- thousand tons	1,148	1,079	United Kingdom 280; Czechoslovakia 201; West Germany 175; Spain 173.
Ferroalloys	32	52	Sweden 41; United States 11.
Scrap	20,461	27,588	Italy 22,153; Yugoslovia 2,601; West Germany 1,679.
Rolled products	41	171	France 111; Ivory Coast 29.
Lead:			
Ore	93,451	137,583	France 105,887; Italy 14,924; Belgium-Luxembourg 8,523; Switzerland 3,416.
Metal, all forms	24,159	14,015	France 13,725.
Magnesium, scrap	19	5	All to West Germany.
Manganese ore:			
Metallurgical	316,210	290,459	France 225,885; United States 14,374; Norway 11,250; Netherlands 8,650.
Other	117,800	59,198	France 21,469; United States 20,834; West Germany 5,258.
Molybdenum ore	----------	1,443	All to Belgium-Luxembourg.
Tin ---- long tons	[3] 5	----------	

See footnotes at end of table.

TABLE 2.—Morocco: Exports of major metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals—Continued			
Zinc:			
Ore	63,327	66,233	France 50,133; Poland 10,000.
Metal, all forms	56	20	All to France.
Other [4]	3,482	4,306	West Germany 2,168; France 1,095; Italy 600.
Nonmetals:			
Barite	67,069	81,810	United States 41,638; United Kingdom 14,792 Italy 10,050.
Cement	19,296	28,562	All to Spain.
Clays:			
Refractory	3,621	2,890	Spain 2,880.
Smectic [5]	33,520	35,683	France 22,930; Spain 8,472; Algeria 967.
Fertilizers, mineral, phosphate rock thousand tons	8,132	8,527	Belgium-Luxembourg 941; United Kingdom 818; West Germany 746; Spain 725; Poland 404; Netherlands 395; Sweden 286; Italy 283; Portugal 282; Denmark 239.
Fullers' earth	2,294	73	All to Algeria.
Fluorspar	NA	1,523	All to Belgium-Luxembourg.
Gypsum	23,390	18,744	Portugal 10,515; Senegal 5,056; Denmark 1,725.
Lime	502	532	All to Spain.
Marble	6,667	6,827	Italy 4,653; Belgium-Luxembourg 1,389.
Ochre	1,078	841	France 786.
Pyrite:			
Crude	1,799	6,044	Belgium-Luxembourg 4,520; West Germany 1,523.
Roasted	23,614	19,860	Sweden 9,375; West Germany 8,335.
Salt	13	10	All to ships' stores.
Sulfur	324	(6)	All to Algeria.
Sand	19,857	12,961	All to Spain.
Stone, dimension	49,686	7,945	Spain 7,920.
Other [7]	1,319	1,330	Spain 1,180; Senegal 147.
Mineral fuels:			
Coal (all ranks) [8]	159,920	175,710	France 80,059; Belgium-Luxembourg 31,575; Algeria 27,535.
Petroleum refinery products: [9]			
Gasoline thousand 42-gallon barrels	2	1	Mainly to United States.
Kerosine do	13	17	France 8; United States 4.
Gas oil do	24	----------	
Fuel oil do	2	----------	
Lubricants do	1	----------	

---

[1] Except where otherwise stated, includes ingots, equivalent forms, and semimanufactures.
[2] Includes alloys.
[3] Includes 1 ton of scrap.
[4] Metallic slags, residues, and unspecified ores.
[5] Includes bentonite.
[6] Less than ½ unit.
[7] Includes graphite, ornamental granules, quartz, and unspecified.
[8] Includes briquets and coke, if any.
[9] Excludes exports and reexports from Ceuta and Melila (Spanish enclaves) Quantities not available except for stock changes, the approximate imports.
NA Not available.

TABLE 3.—Morocco: Imports of major metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals: [1]			
Aluminum and its alloys, all forms	1,773	1,811	France 1,675; Sweden 63; Italy 16; United Kingdom 12.
Antimony	30	20	Turkey 10; U.S.S.R. 5; France 3; Belgium-Luxembourg 2.
Bauxite	3,236	2,553	All from France.
Copper and its alloys, all forms	2,174	3,082	France 2,443; Italy 243; United Kingdom 206; Yugoslavia 101.
Iron and steel:			
Pig iron	877	1,453	France 982; West Germany 421.
Ferroalloys	212	225	France 195; Sweden 20.
Scrap	101	3	United States 2; France 1.
Semimanufactures	20,694	14,153	France 11,737; West Germany 835; Yugoslavia 598.
Other [2]	73	383	Italy 173; United States 160.

See footnotes at end of table.

TABLE 3.—Morocco: Imports of major metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals—Continued			
Lead, including scrap	122	142	France 124; Spain 16.
Manganese ore, chemical grade	50	161	West Germany 88; Ghana 73.
Mercury .... 76-pound flasks	29	105	Spain 96; France 8.
Molybdenum	....	50	All from France.
Nickel, including alloys	174	388	Italy 278; France 64; Canada 41.
Tin .... long tons	292	302	Malaya 272; West Germany 13; United Kingdom 10.
Zinc	816	854	Belgium-Luxembourg 420; France 163; U.S.S.R. 126; Yugoslavia 87.
Ores, unspecified [3]	145,000	310,000	All from Algeria.
Nonmetals:			
Abrasives, natural	8	7	France 6.
Asbestos	2,213	2,353	Rep. of South Africa 936; Canada 908; France 501.
Barium minerals	12	12	Mainly from West Germany.
Borates	94	354	United States 210; France 144.
Cement	4,885	4,354	France 4,004; Denmark 271; Belgium-Luxembourg 55.
Chalk	3,275	3,461	France 3,280; Belgium-Luxembourg 120.
Clays:			
Kaolin	1,470	4,315	United Kingdom 4,065; United States 160.
Refractory	4,721	5,316	France 3,087; British Territories in America 1,372.
Smectic [4]	2,939	3,087	Algeria 3,039; France 45; Italy 3.
Other	395	536	France 509; United States 11.
Diatomite	465	742	Algeria 262; Belgium-Luxembourg 262; France 62; United Kingdom 60.
Dolomite	455	703	France 701; West Germany 2.
Feldspar	220	70	All from France.
Graphite	19	21	Do.
Kyanite [5]	106	14	All from the United States.
Lime	577	1,031	France 997; Cuba 30.
Magnesite	60	2	Mainly from France.
Marble	911	489	Italy 469.
Pigments, mineral	405	528	France 527.
Potash	12,389	13,447	France 5,347; West Germany 4,200; East Germany 2,005; Italy 1,140.
Pyrite, roasted	140,888	818	All from Spain.
Salt	593	1,973	Algeria 1,774; France 195.
Sand	8,153	9,804	Belgium-Luxembourg 9,250; West Germany 210; Senegal 200.
Sulfur	8,615	4,100	France 3,215; West Germany 826.
Talc	1,670	1,895	France 1,353; Italy 300; Norway 237.
Vermiculite	50	53	Rep. of South Africa 48; France 5.
Other [6]	376	226	France 161; Rep. of South Africa 48.
Mineral fuels:			
Coal, all ranks	70,529	93,945	Poland 87,977; Belgium-Luxembourg 2,426; Yugoslavia 2,000; Sweden 1,000.
Coke	6,736	9,004	West Germany 8,719; Venezuela 285.
Coal byproducts	1,930	1,362	Italy 463; Belgium-Luxembourg 406; France 195.
Petroleum:			
Crude thousand 42-gallon barrels	896	3,346	Libya 1,219; U.S.S.R. 938; United Arab Republic 757.
Refinery products: [7]			
Gasoline .... do	888	92	Netherlands Antilles 69.
Kerosine .... do	230	136	France 57; Netherlands Antilles 45.
Gas oil .... do	539	52	Kuwait 15; United Arab Republic 12; Portugal 8; France 7.
Fuel oil .... do	555	66	Venezuela 28; France 20; U.S.S.R. 11.
Lubricants .... do	121	125	France 104.
Liquefied petroleum gas .... do	52	2	Mainly from France.
Asphalt .... do	210	236	France 85; Netherlands Antilles 55; Venezuela 27.
Other .... do	70	44	France 26.
Total	2,665	753	

---

[1] Except where otherwise stated includes ingots, equivalent forms and semimanufactures.
[2] Includes granules, powder, and unspecified iron.
[3] Believed to be mainly lead ore.
[4] Includes bentonite.
[5] Includes andalusite.
[6] Includes cryolite, fluxing stone, fuller's earth, calcined gypsum, limestone, meerschaum, mica, ornamental granules, phosphate rock, quartz, quartzite, crushed stone, slate, and unspecified.
[7] Excludes imports into Ceuta and Melilla (Spanish enclaves), mainly for bunkers. Reported as totaling 6,359.

Source: Statistiques du Mouvement Commercial et Maritime du Maroc (Foreign Trade Statistics of Morocco). 1962 and 1963.

COMMODITY REVIEW

METALS

Antimony.—Bolstered by higher world prices, production of antimony ore in 1964 reached a new peak of 3,282 metric tons, averaging about 48 percent antimony. This exceeded the 1963 production by 89 percent in metal content. However, the reported value of $733,000 for the 1964 production was 270 percent greater than that of 1963. Preliminary reports indicate that exports of antimony ore did not keep pace with production; 1964 exports were only 1,608 metric tons valued at about $359,000, an increase over those in 1963 of only 19 percent in volume and 127 percent in value. As in previous years, all production was from small mines, some of which were reopened in 1964 after having been closed for years. The largest producing company was Omnium de Gerance Industrielle et Minière, which operated several small mines near Djemaa de M'Rirt, northeast of Oued Zem. At yearend the labor force engaged in mining antimony ore comprised 462 men.

Cobalt.—Although the 1964 production totaling 15,253 metric tons of cobalt concentrates was only 11 percent greater than that in 1963, the higher grade of the concentrates in 1964 resulted in an increase of 22 percent in production of contained metal. Exports in 1964 of 14,601 metric tons valued at $1.9 million were 13 percent less in weight and 26 percent less in value than exports in 1963. The major development during the year was the exhaustion of reserves at the Bon Azzer mines south of Ouarzagate, operated by the Société Minière de Bon Azzer, the country's only producer; operations at that mine during the latter part of the year were limited to the reworking of tailings. This company continued exploration of cobalt deposits at Aghbar, 10 kilometers east of Bon Azzer, but reportedly was experiencing difficulties in opening a new mine in that area. At yearend the estimated number of employees engaged in the cobalt operation was 515. Moroccan stocks of cobalt concentrates as of December 31 were 3,948 metric tons.

Copper.—Discrepancies existed in available data on Morocco's copper concentrates production and exports, but apparently no significant changes in trends developed during the year. Although no details have been published, a copper deposit was reportedly discovered in the Djebel Sarhro region (south of Boumalne) by Westfield Minerals, an associate of Northfield Mines, Inc.

Iron Ore.—Continuing a long-established declining trend, production of iron ore in 1964 totaled only 888,000 metric tons valued at $7.37 million, compared with 1,035,000 tons and $8.64 million in 1963. Iron ore exports also declined, but the 2-percent drop to 1.06 million tons in 1964 was much less than the 6-percent decline in exports between 1962 and 1963. Principal recipients of Morocco's iron ore in 1964 and percentages of total received were: West Germany 45, United Kingdom 19; France 14; and Czechoslovakia 10. The increased exports permitted disposal of some stocks, but over 500,000 tons were still stocked at the mines at yearend. Iron ore mining operations remained concentrated near Nador. Compagnie Espagnole de Mines du Rift, the country's largest producer and operator of the Uizan mines, about 14 kilometers southwest of Nador, announced a project to sink a 350-meter central shaft in this area and to drive lateral headings up to 4,300 meters long. The planned annual production goal is 1.2 million tons. At yearend about 2,500 workers were employed by the iron ore industry, excluding pyrite operations.

Lead and Zinc.—Surpassed only by phosphate rock, combined lead and zinc output in 1964 was Morocco's second most important mineral industry product, both by value ($25.3 million) and in terms of workers employed (4,514). While lead concentrate production in 1964 (103,944 metric tons averaging 68 percent lead) was 2 percent less than in 1963 (106,073 tons averaging 69 percent lead), the value in 1964 increased by 61 percent to $17.4 million because of the increased world price. Exports followed the same general pattern; the quantity (81,710 tons) was 41 percent less but the value ($13.6 million) was 17 percent greater than in 1963.

Exploration at one of the largest lead-zinc mines, the Bon Beker of the Société de Mines de Zellidja, did not find replacement for the loss of reserves and production anticipated as mining reaches the point where the downward extension of this ore body crosses into Algeria. Minerals Research of Morocco, Inc., a U.S.-owned company, was preparing lead deposits in the Taisennt area, northeast of Ksar es Souk, for production to start early in 1965.

Processing of 24,960 tons of lead concentrate at the Oued el Haimer smelter of Fonderies Penarroya-Zellidja produced 18,839 tons of lead metal in 1964; exports of the metal totaled 17,357 tons.

Zinc concentrate production increased 37 percent in 1964 to 80,967 tons; this increase coupled with improved price, resulted in an increase in value of 116 percent to $7.9 million. Exports in 1964 rose 37 percent in quantity to 74,279 tons, and 107 percent in value to $7.3 million. No data were available on individual mine or company production for 1964. At yearend the lead-zinc industry employed 4,514 workers.

Manganese Ore.—No major changes occurred in production and export levels for Moroccan manganese ore in 1964. Details on destinations of 1964 exports were not available but preliminary reports indicated that increased sales of metallurgical-grade manganese ore to France were a significant factor in maintaining the level of exports for that commodity. Data on production by mines, companies, and districts were not available.

NONMETALS

Barite.—Production and exports of barite in 1964 were slightly under the record levels established in 1963, but the 89,844 metric tons produced and the 91,582 tons exported exceeded the levels achieved in any other year. Local sales totaled 1,230 tons in 1964.

Fluorspar.—Although the rate of expansion slowed considerably in 1964, the 6,570 metric tons produced exceeded 1963 production by 3 percent and was 13 times greater than 1962 production. Output from a deposit near Meknes, placed in operation by Société Anonyme des Enterprises Minières in 1963, was a major factor in the expanded production. Exports in 1964 of 9,105 tons were six times greater than in 1963. Data on destinations are not available for 1964, but in 1963 all of the fluorspar exports went to Belgium-Luxembourg.

Phosphate Rock.—Phosphates continued to be Morocco's most important mineral resource and foreign exchange earner. In 1964, both production and exports increased about 18 percent to attain new peaks in excess of 10 million tons; each category was valued at about $115 million. Phosphates accounted for over two-thirds of the value of the total 1964 mineral output and for over four-fifths of the value of total 1964 mineral exports. At yearend 13,244 workers were employed by the industry.

A major development was the progress made on the expansion program of Government-owned Office Cherifienne des Phosphates. Announced goal of this program is to increase production by 1 million tons each year for the next 7 years. In the Khouribga area, progress was made on three main projects—an open-pit and underground mine at Meraa el Arech, a drying plant at Beni Idir with provisions to add a washing plant later, and an open-pit mine at Sidi Daoui Sud. By yearend a shaft for the underground mine was completed, construction of service and storage facilities was well advanced, the Marion 7,900 dragline for the open-pit operation was on site and being assembled, installation of the conveyor belt to take the ore to the Beni Idir drying plant was nearing completion, and 4 of the planned 10 ovens, each capable of drying 1 million tons of rock per year, were in place and the building was being constructed over them. To facilitate handling of expanded production, the capacity of the storage area at Casablanca harbor was being increased from 0.4 to 1 million tons, and loading facilities were being improved to permit ships to be loaded at the rate of 6,000 tons per hour.

The major development affecting Morocco's second largest phosphate-producing area, Youssifia (about 60 kilometers east of Safi), was the progress made on the new chemical complex at Safi. At yearend, construction of that project was nearing completion and the planned inauguration of the project by mid-1965 seemed assured; scheduled annual output was 200,000 tons of triple superphosphate and 150,000 tons of diammonium phosphate. This project will require 500,000 tons of phosphate rock annually from Youssifia.

An executive of Occidental Petroleum Corp., a U.S. firm, announced that an accord in principle had been signed with OCP to establish jointly a chemical industry to process 5 million tons of phosphate rock annually; no final commitments were reported on this project at yearend.

Pyrites.—No significant changes in production and export trends were evidenced in 1964. Of the 21,220 tons of pyrite produced in 1964, about 17,700 tons were consumed domestically by the Société Cherifienne des Engrais for the production of sulfuric acid. However, the domestic requirements for sulfuric acid were to increase 500,000 tons annually when the chemical complex at Safi commenced operations in 1965. To meet this increased demand, a major development program was initiated at the Kettara pyrite mines, about 25 kilometers northwest of Marrakech, operated by the Société d'Exploitation de Pyrrhotines de Kettara (97.5 percent Government owned). A 200-meter shaft had been completed, and the sinking of a 450-meter shaft was in progress. When this shaft is completed and equipped, posibly in 1968, a daily output of 2,000 tons by sublevel stoping is planned. Reserves at yearend were estimated at 12 million tons, averaging 35 percent sulfur, 57 percent iron, and 0.7 percent copper.

MINERAL FUELS

Coal.—The Moroccan coal industry continued to decline in 1964, particularly in exports which declined 26 percent in quantity and 40 percent in value. However, domestic consumption increased 17 percent to 241,140 tons. At midyear the Moroccan Government acquired majority control of Charbonnages Nord-Africains, the company that operates the Djerada anthracite mines. This company had been operating at a deficit for several years and the Government, under the terms of acquisition, suppressed the previous state guarantee for interest payments on capital invested by the company's stockholders.

Petroleum and Natural Gas.—Production of natural gas increased by 17 percent in 1964, but crude oil output dropped 20 percent to 900,000 barrels. All production was by Societe Cherifienne des Petroles (SCP), a firm jointly owned by the Moroccan Bureau de Recherches et de Participations Minières (BRPM) and the French Government firm, Bureau de Recherches de Petrole (BRP). Exploration efforts included geological (54 party months), geophysical (29 party months), and drilling activities. Drilling activities are summarized in table 4. Oil showings reportedly were found in Paleozoic formations in hole SN 1, drilled by the Federal Republic of Germany firm, Preussische Bergwerks und Hütter Aktiengellschaft (PREUSSAG), in the Doukkala permit area. All production in Morocco has been from Mesozoic or Miocene formations.

TABLE 4.—Summary of exploration drilling in Morocco, 1964

Operator	Well name	Location	Date spudded	Date completed	Total depth Dec. 31, 1964 (feet)	Remarks
Canadian Delhi Oil Ltd. (CANDEL).	TMT 1	Ksar-es-Souk	Oct. 23, 1963	Jan. 16, 1964	6,007	Dry and abandoned.
	CTG 1	do	Feb. 27, 1964	Apr. 3, 1964	3,041	Do.
Pétrofina S.A	AZ 1	Draa	Feb. 1, 1963	Jan. 4, 1964	11,483	Do.
Preussische Bergwerks und Hütter Aktiengesellschaft (PREUSSAG).	BHL 1	Doukkala	Feb. 3, 1964	June 12, 1964	9,095	Do.
	SN 1	do	June 18, 1964		9,272	Drilling.
Société Cherifienne des Pétroles (SCP)	GDA 1	Rharb-Prerif	Jan. 14, 1964	Feb. 29, 1964	6,867	Dry and abandoned.
	BSG 1	Souss	Mar. 15, 1964	Apr. 10, 1964	3,307	Do.
	AOK	do	June 5, 1964	Sept. 6, 1964	5,866	Do.
	JBL 1	Essaouira	June 12, 1964	July 17, 1964	1,027	Do.
	RR 1	Moulouya	Nov. 16, 1964		3,606	Drilling.
	JBL 1 (bis)	Essaouira	Nov. 28, 1964		919	Do.

Source: Bulletin of the American Association of Petroleum Geologists. V. 49, No. 8, August 1965, p. 1252.

The Mineral Industry of Nigeria

By William C. Henkes[1]

⁂

NIGERIA'S mineral industry participated in the general economic advance of nearly all major sectors of the Nigerian economy in 1964. In the first 5 months foreign trade reached record highs: Exports increased 21 percent to $272 million and imports increased 26 percent to $283 million.[2] [3] Growing petroleum exports suggested a more favorable future trade balance. Petroleum production for the year was approximately 44 million barrels valued at about $83 million; essentially all of this was exported. Tin and columbite remained the chief nonfuel minerals from the standpoint of production and exports.

Although mineral production accounts directly for only a small percentage of Nigeria's gross national product of about $4,120 million (in current prices), some products are of considerable significance in a worldwide sense. For example, the country supplied about 45 percent of the world production of columbium ores in 1964.

Nigeria's petroleum and natural gas production was of world significance in that it provided a greater diversification of sources for the petroleum markets of the free world. The expanding industrialization of the countries of Africa also represents a large potential market for this fuel.

GOVERNMENT POLICIES AND PROGRAMS

The Nigerian Government continued its policy of creating an investment climate favorable to foreign capital. In August 1964, new tariff regulations were announced greatly increasing duties on most imported commodities except for industrial and agricultural machinery as well as certain raw materials. Following protests by business and industry against some of the high duties—especially one of 33⅓ percent ad valorem on spare parts—the Government revised these regulations in November reducing the duty on spare parts to 5 percent. High import duties remain on luxury items and on commodities manufactured locally.

Negotiations were underway with the European Economic Community aimed at an association with the Community. At yearend some points of agreement had been reached, but discussions were continuing.

---

[1] Petroleum engineer, Division of International Activities.

[2] International Commerce. V. 70, No. 46, Nov. 16, 1964, p. 9.

[3] Where values have been reported in Nigerian pounds (N£), they have been converted to U.S. dollars at the rate of N£1=US$2.80.

In May, the Government completed preparation of a new Petroleum Law. This law was circulated in draft form to companies and other interested groups for comments and suggestions before being presented to Parliament for enactment.

PRODUCTION

The general growth in mineral production in 1964 was paced by the 59-percent increase in crude oil production. Other sizable gains in output were made in limestone, cement, coal, and columbium concentrate. Outputs of tin and zircon concentrate were virtually at the same levels as in 1963. Production of tantalum concentrate and gold decreased 34 and 23 percent, respectively.

The increases in limestone, cement, and coal production are believed to reflect the increased industrialization of the country, and the output growth of petroleum and columbium concentrate resulted from increased world demand for these commodities.

TABLE 1.—Nigeria: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Columbium, concentrate	2,081	2,385	2,298	2,044	2,381
Gold ... troy ounces	994	676	384	316	244
Lead, content of ore and concentrate	202	6	----------	----------	----------
Monazite, concentrate	12	7	9	11	10
Tantalum, concentrate ... kilograms	11,176	11,898	17,242	15,240	10,000
Tin:					
Cassiterite, concentrate:					
Gross weight ... long tons	10,374	10,511	11,096	11,788	11,787
Tin content ... do	7,675	7,779	8,210	8,723	8,721
Metal (smelter output) ... do	----------	623	8,024	9,051	8,748
Zircon, concentrate	1,785	756	[1] 494	804	[1] 564
Nonmetals:					
Cement ... thousand tons	168	364	[r] 483	[r] 527	660
Clay:					
Kaolin	4	----------	5	15	NA
Miscellaneous (for drilling muds)	NA	5,016	[e] 4,000	[e] 1,700	NA
Limestone	244,111	599,405	724,539	769,665	996,435
Mineral fuels:					
Coal	571,380	607,341	634,326	[r] 595,545	699,252
Petroleum, crude ... thousand 42-gallon barrels	6,552	16,802	24,624	27,644	43,997
Natural gas ... million cubic feet	[r] 4,949	13,802	18,159	NA	36,333

[e] Estimate. [r] Revised. NA Not available.
[1] U S. imports.

TRADE

During the first 5 months of 1964, Nigeria's foreign trade increased both in exports and imports. Total exports (including reexports) during that period were $271.5 million, compared with $224 million for the same period of 1963; imports were $283 million, compared with $225 million in 1963. Indications were that exports for all of 1964 would reach $588 million and that imports would reach $645 million.[4]

---

[4] U.S. Embassy, Lagos, Nigeria. Airgram, A-190, Sept. 12, 1964.

Total imports and exports for Nigeria for 1963 were very near those previously estimated: Exports totaled $517.5 million and imports $581.1 million. Although the United Kingdom remained the principal destination and source of Nigeria's exports and imports, its share of exports decreased from 42.9 to 39.9 percent and its share of imports decreased from 36.3 to 34.1 percent. The United States received 9.4 percent of Nigeria's exports in 1963 and supplied 8.6 percent of that country's imports. The European Economic Community increased its share of both exports and imports from Nigeria.

Trade with Communist countries was a small part of Nigeria's total foreign trade. Exports to these countries totaled $6.4 million (1.2 percent); only $266,000 (0.3 percent) were minerals—tin and tin concentrate to Poland. Imports from these countries were $19.8 million, 3.4 percent of total imports; minerals, unwrought metals, and semimanufactures accounted for $4.4 million and nearly 70 percent of this consisted of cement.

TABLE 2.—Nigeria: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum, concentrate	NA	9	All to Sierra Leone.
Columbium, concentrate	2,302	1,625	United Kingdom 557; United States 481; Netherlands 463.
Copper, concentrate, including matte	NA	83	France 71; Netherlands 12.
Iron and steel:			
Castings, unwrought	NA	4,572	All to Canada.
Ferrous scrap	4,624	5,316	Sweden 2,540; Ghana 1,044; Israel 1,016; Egypt 508.
Lead, concentrate	620	198	Belgium-Luxembourg 191.
Tantalum, concentrate	13	20	United States 18.
Tin:			
Concentrate ... long tons	347	160	United States 105; Poland 45.
Metal ... do	8,024	9,673	United Kingdom 6,710; United States 2,342; France 441.
Zirconium, concentrate	---	890	All to United States.
Nonferrous scrap	1,901	2,346	Italy 573; West Germany 483; Netherlands 342; Japan 262.
Other ores, nonferrous	1,782	978	United States 669; United Kingdom 159 Netherlands 73.
Nonmetals:			
Cement	---	416	All to Niger.
Fertilizers, crude	---	782	Ghana 596; Togo 132.
Salt	NA	85	All to Ghana.
Other minerals, crude	NA	47	Ghana 37.
Mineral fuels:			
Coal	32,716	8,160	All to Ghana.
Coke and semicoke	NA	8,255	Ghana 8,128; Canada 102.
Briquettes	NA	26,544	Ghana 26,316; Canada 203.
Petroleum:			
Crude ... thousand 42-gal. barrels	[r] 24,572	27,998	United Kingdom 17,163; West Germany 7,280.
Bunkers ... do	NA	[e] 210	NA.

[e] Estimate. [r] Revised. NA Not available.

TABLE 3.—Nigeria: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys:			
Unwrought	3,347	2,710	United Kingdom 1,306; Canada 742; West Germany 353.
Semimanufactures	1,994	3,281	United Kingdom 1,032; Belgium-Luxembourg 775; Austria 525.
Copper, all forms	1,804	2,250	United Kingdom 1,594; Japan 379.
Iron and steel:			
Ore and concentrate		44	United Kingdom 31; Niger 13.
Pig iron, ferroalloys, ingots, and similar forms.	^{r}1,154	6,625	United Kingdom 4,012; Belgium-Luxembourg 782; United States 315.
Bars, shapes, plates	^{r}93,416	107,181	Japan 32,212; United Kingdom 26,641; Belgium-Luxembourg 23,012.
Rails and track material	^{r}17,166	10,486	United Kingdom 10,172.
Strip and wire	^{r}1,167	3,891	United Kingdom 1,528; West Germany 1,173; Belgium-Luxembourg 720.
Tubes, pipes, and fittings	^{r}28,753	42,610	United Kingdom 12,522; West Germany 8,477; France 5,728; United States 5,425.
Lead and alloys all forms	1,198	420	United Kingdom 246; Belgium-Luxembourg 134.
Precious metals, all forms. troy ounces	13,737	27,075	United Kingdom 26,337.
Tin and alloys, all forms long tons	74	3	United Kingdom 3.
Zinc and alloys, all forms	37	39	Belgium-Luxembourg 14; United Kingdom 12; Netherlands 11.
Nonferrous metals, unspecified	13	NA	
Nonmetals:			
Asbestos, crude and semimanufactures	19,146	29,930	United Kingdom 17,179; Israel 3,655; Italy 2,411.
Cement	340,256	305,034	Poland 114,743; United Kingdom 49,035; Czechoslovakia 27,787.
Clay products	^{r}7,051	7,354	United Kingdom 3,055; Italy 2,051; West Germany 510.
Fertilizers:			
Nitrogenous	^{r}4,211	3,089	Italy 1,453; United Kingdom 1,187.
Phosphatic	12,028	8,402	Italy 6,554; Netherlands 899.
Potassic	1,363	666	West Germany 485; United Kingdom 39.
Unspecified	3,318	4,300	Netherlands 1,106; West Germany 1,022; United Kingdom 889.
Gypsum	34,077		
Lime	4,326	7,067	United Kingdom 4,954; Belgium-Luxembourg 1,889.
Salt	113,255	6,300	United Kingdom 4,279; East Germany 944.
Stone, sand, and gravel	NA	33,412	France 28,328; Italy 2,098.
Crude minerals, not elsewhere specified.	NA	29,666	Tunisia 22,571; United Kingdom 2,657.
Mineral fuels:			
Coal, coke, and briquets	1,461	1,421	United Kingdom 1,381.
Petroleum refinery products:			
Gasoline thousand 42-gal. barrels	^{r}2,367	2,617	Netherlands Antilles 477; Italy 456; Venezuela 335; United States 301.
Kerosine do	^{r}979	1,201	Netherlands Antilles 260; Italy 208; Iraq 183; United States 157.
Jet fuel do	^{r}373	352	Italy 129; Netherlands Antilles 88.
Distillate fuel oil do	^{r}2,790	2,786	Italy 529; Venezuela 455; Netherlands Antilles 435; United States 374.
Residual fuel oil do	751	640	Spain 258; Aden 201; Netherlands Antilles 62.
Lubricants do	^{r}157	164	United Kingdom 64; United States 33; Netherlands Antilles 23.
Asphalt, wax, etc. (solid)	^{r}24,585	15,011	Netherlands Antilles 7,558; Netherlands 2,820; West Germany 1,472.

^{r} Revised. NA Not available.

COMMODITY REVIEW

METALS

Lead and Zinc.—Following the rise in world prices of lead and zinc, the mine at Nyeba, 19 kilometers south af Abakaliki, Eastern Nigeria, was reopened by the Nigerian Lead and Zinc Mining Co., Ltd. The mine had never produced commercially and was shut down in 1956 after 12 years of intermittent exploration and development. Extraction of ore began in July 1964, and it was expected that exports would begin in April 1965.

At the planned production rate of 330 metric tons of ore per day, the proved reserves are estimated to be sufficient for an 8- to 10-year operation. Daily concentrate output from this ore is expected to average 70 to 75 tons of combined galena and sphalerite and 30 to 40 tons of siderite with 45 to 48 percent iron content. The initial galena-sphalerite concentrate will average about 70-percent lead. The siderite concentrate will be stockpiled for possible eventual use by a domestic iron and steel plant which is in the planning stage. The West German smelting company, Metallgesellschaft A.G. of Frankfurt which owns a small interest in Nigerian Lead and Zinc, has contracted to purchase the company's entire lead and zinc production for 10 years.[5]

Tin and Columbite.—Nigeria continued to be the chief world source of columbium ores; in 1964 it supplied approximately 45 percent of this commodity, virtually all produced from tin-columbite ores. Production of the major companies was 1,745 metric tons. One of the smaller producers of columbite reported an average selling price in early 1964 equivalent to $1,324 per metric ton of ore.[6]

The largest producer of tin in Nigeria, Amalgamated Tin Mines of Nigeria, Ltd., reported a marked increase in production of tin concentrate during the year ending March 31, 1964; this company also quoted an average price of $3,494 per long ton of tin for mid-1964.[7] The Makeri Smelting Co., Ltd., in Jos, Northern Region, remained the country's only tin smelting company.

Operators reported proved and indicated reserves of 67,900 metric tons of columbite as of March 1963. The reserves of cassiterite are estimated by the same source to be at about 146,600 metric tons.[8]

---

[5] U.S. Embassy, Lagos, Nigeria. Airgram, A-58, Mar. 11, 1965.

[6] Metal Bulletin. No. 4936, Oct. 6, 1964, p. 19.

[7] Mining Journal (London). V. 263, No. 6739, Oct. 16, 1964, p. 291; Tin International, December 1964, p. 344.

[8] Ministry of Mines and Power. Annual Report of the Mines Division. Lagos, Nigeria. Mar. 31, 1963, p. 24.

TABLE 4.—Nigeria: Tin and columbite production by major companies, 1964

Company	Tin (long tons)	Columbite (metric tons)
Amalgamated Tin Mines of Nigeria, Ltd	4,697	588
Bisichi Tin Co. (Nigeria) Ltd	895	545
Ex-Lands (Nigeria) Ltd	650	---
Forum Extended Ltd	344	11
Gold and Base Metal Mines of Nigeria, Ltd	763	48
Jantar Nigeria Company Ltd	342	536
Jos Tin Areas Ltd	169	---
Kaduna Prospectors Ltd	391	
Kaduna Syndicate Ltd		---
United Tin Areas of Nigeria Ltd	22	17
Total	8,273	1,745

Source: International Tin Council.

NONMETALS

Cement.—During 1964, plans were announced for construction of Nigeria's seventh and eighth cement plants. One is to be built by the Mid-Western Regional Government at a cost of about $11 million,[9] and the other is planned at Calabar, Eastern Region, and is to be financed by a $9.8 million loan from West Germany.[10] Completion of these plants will give Nigeria an annual capacity of about 1.27 million metric tons of cement.

MINERAL FUELS

Petroleum.—Petroleum continued to be Nigeria's principal mineral product. Over 65 percent of the value of mineral exports for 1963 was accounted for by petroleum. Crude oil production during 1964 had a value of nearly $83 million, and exports for the first half of the year were 16.9 million barrels. Production increased 59 percent over that of 1963.

A measure of the direct financial contribution of the petroleum industry to the country's economy was the payment by the oil companies of $56 million in capital goods imports and $84 million in rents, royalties, premiums, materials, labor, taxes, and other payments in Nigeria in 1964.[11]

Following Libya, Algeria, and the United Arab Republic (Egypt), Nigeria ranked fourth among the African oil producing countries with an average production of 113,000 barrels per day. This production is a very small part of the worldwide supply, but it is potentially quite important to the continent of Africa. Nigerian crude oil exports to the United Kingdom amounted to 5.7 percent of that country's crude oil imports.[12]

Construction of the new 42,850-barrel-per-day-capacity refinery at Alesa Eleme, near Port Harcourt, proceeded on schedule and it was expected to go on stream in mid-1965. With petroleum product imports in 1963 of more than 7.7 million barrels valued at about $43 million, this refinery will present a very great saving in foreign exchange.

---

[9] International Commerce. V. 70, No. 46, Nov. 16, 1964, p. 10.
[10] Africa Report. V. 9, No. 10, November 1964, p. 24.
[11] U.S. Embassy, Lagos, Nigeria. Airgram A-626, Apr. 16, 1965.
[12] Petroleum Times. V. 69, No. 1761, Feb. 5, 1965, p. 85.

Exploration and Development.—Exploratory drilling in 1964 was highly successful. With 14 drilling rigs operating at yearend, 4 new offshore and several onshore discoveries had been made; the Shell-BP Petroleum Development Co. of Nigeria (jointly owned by Royal Dutch-Shell and British Petroleum Co.) announced and identified 14 previously discovered fields.

Nigerian Gulf Oil Co. (Gulf Oil Corp.) made one onshore and two offshore discoveries. In October, the Tubu No. 1X, near Bonny Beach, about 35 miles southeast of Port Harcourt, was completed testing 416 barrels of 35.5° API oil per day from the Tertiary at 7,680 feet.[13] The onshore discovery, Robertkiri No. 1X, 30 miles south-southwest of Port Harcourt, tested 2,300 barrels of 38.5° API oil per day from a 520-foot pay zone at 11,802 feet. The third discovery was the Meji No. 1X, 10 miles south of the Okan field; tests of a zone at 9,104 feet produced 39.1° API oil at the rate of 1,230 barrels per day, and a zone at 9,920 feet tested 1,570 barrels of 37.6° API oil per day.[14]

The Okan offshore field, discovered by Nigerian Gulf in December 1963, was developed during the year and was expected to begin production early in 1965 at a rate of about 25,000 barrels per day; the field had 11 producing wells and 2 dry holes.[15]

Mobil Exploration Nigeria, Inc. (Socony Mobil Oil Company, Inc.) drilled eight wells in its concession Blocks "L" and "M"; two were oil producers, three had oil shows, and three were dry holes. The first producer, the No. L–A1, flowed 600 barrels of 35° API oil per day from the zone 5,655 to 5,661 feet; the second well, the No. M–A2, tested 530 barrels per day of 19° API oil from the interval 4,538 to 4,543 feet.[16]

Tennessee Nigeria, Inc. (Tennessee Gas Transmission Co.), with its partners Sinclair Nigerian Oil Corp. (Sinclair Oil Corp.) and Sunray Nigeria Inc. (Sunray DX Oil Company), made a discovery south of the Ughelli field; the Owopele No. 1 tested 1,000 barrels per day of heavy oil (22° API) from a zone at 8,900 feet and 1,000 barrels per day of 37° API oil from 9,400 feet, both from beds of Miocene age.

Production.—Shell-BP's onshore production increased more than 61 percent in 1964. With construction of new pipeline systems linking new fields to the export facilities on the Bonny River and start of production from the offshore 25,000-barrel-per-day Okan field, the year 1965 should see further increases in crude oil output. More than 70 oil and gas fields have been found in the country and the majority are awaiting pipeline outlets before production can begin.

During the first half of 1964, the leading oilfield was the Bomu field, discovered in 1958, with an average production of 53,000 barrels per day from 18 wells; second in production was the Imo River field with an average of 18,500 barrels per day from 15 wells.

---

[13] Oil and Gas Journal. V. 62, No. 52, Dec. 28, 1964, p. 120.
[14] Oil and Gas International. V. 5. No. 2. February 1965, pp. 79–80.
[15] Work cited in footnote 14.
[16] Oil and Gas International. V. 5, No. 3, p. 52.

Export Facilities.—A new jetty for loading petroleum products from the Alesa-Eleme refinery was nearing completion at yearend. The terminal will be able to load tankers of up to 18,000 dead weight tons at the rate of 1,000 tons of oil per hour; the refinery and the jetty will be linked by 10 pipelines ranging in size from 6 to 18 inches.[17]

Gas Liquefaction.—At yearend, Shell-BP, Conch International Methane Ltd., and the United Kingdom Gas Council were exploring the possibility of liquefying Nigerian natural gas for shipment to the United Kingdom. Estimated cost of the facilities, including tankers, is $70 to $98 million and initial capacity of the plant would be 100 million cubic feet per day. Costs for Nigerian gas must allow a landed price in the United Kingdom of less than $0.076 per therm in order to compete with liquefied gas from Algeria and natural gas from the Netherlands.

SOURCE MATERIALS

Trade data are from the Nigerian Trade Summary, published monthly. Mineral data is contained in the Annual Report of the Ministry of Mines and Power and in the Annual Report of the Petroleum Division of the same Ministry.

Current production and development data are from the U.S. Embassy, Lagos, and from various trade journals.

---

[17] Petroleum Times. V. 69, No. 1760, Jan. 22, 1965, p. 44.

The Mineral Industry of Rhodesia, (Southern Rhodesia), Zambia, and Malawi

By Thomas C. Denton[1]

❖

THE THREE political divisions of this chapter were members of the former Federation of Rhodesia and Nyasaland, which dissolved as of midnight December 31, 1963. Subsequently, on July 6, 1964, Nyasaland became independent and assumed the name Malawi. On October 24, 1964, Northern Rhodesia also became independent and took the name Zambia. At yearend, Southern Rhodesia still was a self-governing British colony but had dropped "Southern" from its name so to do away with the implication that another Rhodesia still existed.

The most recent year for which the chapter tabulates foreign trade in detail is 1963 when the Federation still existed. The chapter tabulates foreign trade in 1962 and 1963 for the three areas as a whole because the Federation so reported it. But to the extent possible, the origin of exports is shown by area and the separate area discussions include information on foreign trade.

RHODESIA

For the mineral industry and the whole Rhodesian economy, conditions generally were good in 1964, despite some gloomy forecasts early in the year resulting from dissolution of the Federation. The mineral industry exclusive of cement, iron and steel, and ferroalloy manufacturers contributed $74.8 million to gross domestic product (GDP).[2] In 1963, the GDP as estimated at $823.2 million and the mineral contribution was $66.4 million, or about 8 percent.

The 1964 value of production for the mineral industry was less than 2 percent lower than the peak value of $76 million attained in 1961. At yearend the trend was continuing upward and according to the Ministry of Mines could result in a value for 1965 of around $84 million.

To an appreciable extent the improvement in 1964 resulted more from higher prices enjoyed than from increased volume of output.

---

[1] Africa specialist, Division of International Activities.

[2] Where necessary, values have been converted from Rhodesian pounds (R£) at rate of R£1=US$2.80.

TABLE 1.—Former Federation of Rhodesia and Nyasaland: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	Origin within the Federation	1962	1963	Principal destinations, 1963
Metals:				
Antimony ore and concentrate.	Southern Rhodesia.	182	217	Belgium 217.
Beryllium ore and concentrate.	do	457	272	United States 272.
Cadmium metal	Northern Rhodesia.	36	189	Republic of South Africa 189.
Chromium ore and concentrate.	Southern Rhodesia.	391, 613	279, 633	United States 180,748; Norway 34,877; Republic of South Africa 29,447; Japan 14,712; United Kingdom 11,714.
Cobalt:[1]				
Metal	Northern Rhodesia.	894	537	United Kingdom 399; Republic of South Africa 115.
Copper:				
Ore and conentrate	Southern Rhodesia and Northern Rhodesia.	5, 683	14, 076	Republic of South Africa 6,657; Sweden 6,463.
Copper-cobalt matte	Northern Rhodesia.	2, 619	819	Belgium 819.
Copper and cobalt slimes.	do	705	940	Sweden 396; West Germany 299; Japan 222.
Metal, unwrought:				
Blister	Northern Rhodesia and Southern Rhodesia.	120, 849	134, 741	United Kingdom 58,260; West Germany 40,316; United States 9,554.
Electrolytic:				
Wire bar	Northern Rhodesia.	350, 574	378, 608	United Kingdom 144,187; Italy 47,207; Netherlands 30,969; Japan 29,344; West Germany 26,837.
Cathode form	do	38, 356	37, 674	United Kingdom 10,926; United States 10,160; Japan 7,315.
Ingot and bar	do	22, 107	23, 594	India 7,501; United Kingdom 7,329; Republic of South Africa 3,165.
Other not further identified.	do	13, 013	12, 762	West Germany 5,639; Poland 2,489; Italy 2,143.
Semimaufactures, unwrought, including alloys.	NA	1, 001	961	Federation of Malaya 961.
Gold:				
Concentrate	NA	26	59	NA.
Bullion troy ounces		548, 999	557, 271	United Kingdom, quantity NA.
Iron and steel:				
Iron ore	Southern Rhodesia.	120, 459	210, 565	Japan 210,565.
Pig iron, sponge iron, and spiegeleisen.	Southern Rhodesia.	205, 200	216, 699	Japan 191,560; Egypt 19,993.
Ferroalloys	do	8, 208	13, 949	United Kingdom 6,642; Canada 3,807; Japan 1,105; United States 995.
Iron and steel scrap	NA	10, 884	26, 255	Republic of South Africa 20,428.
Iron and steel ingots and equivalent primary forms.	Southern Rhodesia.	9, 300	187	Mozambique 187.
Iron and steel, other[2]	do	2, 511	1, 409	Tanganyika 315; Republic of the Congo (Leopoldville) 265; Bechuanaland 263; Mozambique 153.
Lead, bar and ingot	Northern Rhodesia.	14, 139	14, 089	Republic of South Africa 7,942; United Kingdom 2,255.
Manganese ore and concentrate.	do	45, 862	43, 562	United States 14,210; West Germany 11,587; France 8.175; Japan 5,818.
Nickel ore and concentrate	Southern Rhodesia.	266	579	Japan 360; Canada 217.
Silver, unworked. troy ounces	do	83, 913	85, 077	United Kingdom 84,059; Republic of South Africa 1,018.
Tantalum ore and concentrate.	do	82	89	Netherlands 56; United States 30.
Tin:				
Ore and concentrate. long tons	Mainly Southern Rhodesia.	32	3	United Kingdom 3.
Ingots and bars do	Southern Rhodesia.	558	471	Republic of South Africa 466.

See footnotes at end of table.

TABLE 1.—Former Federation of Rhodesia and Nyasaland: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Origin within the Federation	1962	1963	Principal destinations, 1963
Cobalt—Continued				
Tungsten, ore and concentrate.	Southern Rhodesia	26	2	Republic of South Africa 2.
Zinc:				
Ore and concentrate	NA	1,872	1,542	Republic of South Africa 1,542.
Ingots and bars	Northern Rhodesia.	41,710	47,293	Republic of South Africa 29,889; France 3,047; United States 2,174; Italy 2,082.
Nonferrous metal scrap not further described.	NA	3,185	3,679	Republic of South Africa 1,587; Japan 869; Netherlands 543.
Nonferrous metals not further described.	NA	36	48	Republic of South Africa 23; Republic of the Congo (Leopoldville) 19.
Nonmetals:				
Asbestos	Southern Rhodesia.	131,917	111,689	United Kingdom 32,441; West Germany 14,812; Spain 10,034; India 8,642; United States 5,852; Republic of South Africa 5,104.
Cement	NA	362	125	Tanganyika 86; Bechuanaland 28.
Corundum ore	Southern Rhodesia.	2,973	4,735	Republic of South Africa 3,299; United States 1,431.
Dolomite and limestone	NA	46	55	Republic of South Africa 44; Angola 9.
Fertilizers, manufactured	Southern Rhodesia.	4,244	8,240	Republic of South Africa 7,073.
Fire clay	do	11	706	Republic of South Africa 690; Mozambique 12.
Lithium ores	do	29,671	36,508	United States 22,005; Belgium 3,905; United Kingdom 3,472.
Magnesite	do	8,967	11,631	Republic of South Africa 11,631.
Mica, unmanufactured:				
Block and sheet	do	15	45	Republic of South Africa 19; Japan 18.
Quartzite	NA	--------	18	Mozambique 18.
Vermiculite	NA	4	5	Bechuanaland 3; Mozambique 2.
Mineral fuels:				
Solid fuels:				
Coal, lignite, and peat	Southern Rhodesia.	196,062	249,109	Republic of the Congo (Léopoldville) 154,257; Bechuanaland 58,664; Mozambique 34,115.
Coke	do	53,076	43,007	Republic of the Congo (Léopoldville) 42,544.
Petroleum refinery products:[r] [3]				
Liquid 42-gal. barrels	NA	58,292	25,666	NA.
Solid	NA	128	80	NA.

[r] Revised. NA Not available.
[1] See under copper.
[2] Includes semifinished steel and other unwrought not described in detail.
[3] Reexports.

Particularly, volume for copper and tin was nearly the same as in 1963 whereas value increased by some 28 percent and 43 percent respectively.

The contribution of Rhodesia to world mineral supply continued to be large. In 1964 the country provided nearly 2 percent or more of free world production of six minerals as follows, in percent: Gold 1.8; beryl 4.3; asbestos 7.1; chromite 17.5; tantalum minerals 27.1; and corundum 78.5. For lithium minerals the country's share may have been as large as 75 percent.

Of the minerals named above, Rhodesia furnished the following percentages of United States imports in 1964: Asbestos 2; beryl 7; chromite (chromium content) 25; tantalum minerals 2; corundum 72; and lithium minerals 100.

During the period from July 1, 1963 to March 31, 1964, freight hauled by Rhodesia Railways (jointly owned by Rhodesia and Zambia) totaled 5.3 million tons, of which coal and coke from Wankie,

TABLE 2.—Federation of Rhodesia and Nyasaland: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963	
			Republic of South Africa	Other
Metals:				
Aluminum semimanufactures	1,268	1,170	791	United Kingdom 256.
Copper and copper alloys, all forms	1,032	709	551	United Kingdom 125; Italy 23.
Gold, value ... dollars	135,484	NA	--------	
Iron and steel:				
Pig iron and sponge iron	89	18	18	
Iron and steel ingots and equivalent forms.	1,426	25	24	
Semimanufactures	103,424	83,896	62,317	United Kingdom 11,281; Japan 7,025.
Lead and lead alloys	68	85	72	Australia 10.
Nickel and nickel alloys, all forms	12	10	8	
Tin and tin alloys	49	134	121	United Kingdom 13.
Zinc and zinc alloys	88	586	16	Republic of the Congo (Léopoldville) 549; United Kingdom 21.
Nonferrous base metals, not further described.	751	NA	--------	
Nonmetals:				
Abrasives	187	205	132	United Kingdom 44.
Cement	2,583	45,802	29,804	Kenya 8,051; United Kingdom 6,724.
Fertilizer materials:				
Nitrogenous	85,129	87,114	235	West Germany 59,389; Belgium 11,939; Netherlands 8,715; United Kingdom 2,664.
Phosphatic, superphosphates only.	20,527	27,932	1,423	Netherlands 25,849.
Potassic	26,684	31,539	--------	France 19,349; West Germany 11,717.
Other, chiefly phosphate rock	70,732	93,368	2,449	Senegal 47,005; Morocco 37,053.
Gypsum and plaster of paris	19,354	15,373	14,969	United Kingdom 367.
Lime	9,669	8,297	8,253	
Potash compounds other than fertilizers.	691	438	29	Belgium 166; West Germany 91; Sweden 84.
Salt	40,637	39,279	22,902	Mozambique 7,025; Angola 4,785; United Kingdom 2,311.
Explosives, industrial:				
Prepared explosives	20,948	20,945	20,936	
Fuses	926	840	769	
Detonators, number ... millions	11	10	10	
Primers, percussion caps and igniters, value ... thous. dollars	221	245	242	
Mineral fuels:				
Solid fuels: Coal and coke	63,670	60,116	14,282	Mozambique 45,834.
Liquid fuels:				
Gasoline ... thous. 42-gal. barrels	2,312	2,153	--------	Iran 1,480; Bahrain 593; Aden 64.
Kerosine ... do	340	375	--------	Iran 209; Bahrain 93; Aden 43.
Jet fuel ... do	257	280	--------	Iran 245; Aden 33.
Distillate fuel oil ... do	1,438	1,508	--------	Iran 830; Aden 456; Bahrain 204.
Residual fuel oil ... do	41	42	9	Iran 23; Bahrain 5; Aden 4.
Lubricating oils ... do	NA	132	111	United Kingdom 7; United States 6.
Greases, jelly, waxes	4,152	3,455	1,076	United States 1,084; Indonesia 829.
Asphalt and bitumen	21,595	17,685	15,200	Trinidad and Tobago 1,550; United States 706.
Other ... barrels	[r] 10,062	7,550	193	United Kingdom 2,411; Netherlands 1,511; United States 1,381; West Germany 849.

[r] Revised. NA Not available.

Rhodesia, comprised 1.4 million tons and other minerals, primarily copper, chrome, iron ore, and asbestos 1.6 million tons. Subsequently, these tonnages improved substantially.

GOVERNMENT POLICIES AND PROGRAMS

Government measures to aid mining, particularly gold mining, proposed in 1963 became effective April 1, 1964. The loan fund of the Mining Affairs Board which provides working capital and rents equipment to approved mines was increased from $823,200 to $1.4 million. A subsidy of up to $8.40 per ounce was authorized to cover operating losses of gold mines. In addition, two tax concessions were granted: An increase in the depletion allowance for gold mines from 10 to 15 percent and permission to claim capital expenditure in the year in which incurred.

In August a committee of the Rhodesian Legislative Assembly issued a report that made numerous recommendations to strengthen the mining industry. These included: Examining old records to catalogue information with a view to assessing the potential of dormant mines; expanding Mining Department services, particularly assaying; increasing the term of validity of prospecting notices from 31 to 60 days; exploring mining claims with government assistance, expenditures to be repaid if a mine developed; establishing, if possible, a stockpile of Rhodesian chromite in Europe; making a greater publicity effort among consumers of Rhodesian minerals; and making efforts to increase copper production to a tonnage large enough for economic electrolytic refining in the country.

A further important recommendation was the creation of a Mining Promotion Council, established by statute but independent of departmental control and to be composed of leaders of the mining industry. The Council would promote mineral industry by all available means including those the Committee recommended and would be the necessary contact between the industry and government. The Council met for the first time in October. It called for constructive suggestions and later established procedures and set up a working party to examine the potential of Rhodesian mining.

PRODUCTION

The tabulation that follows shows the extent to which value of production of each major sector of the mining industry improved in 1964 as compared with 1963 figures.

Commodity	Value			
	1963		1964	
	Million dollars	Million Rhodesian pounds	Million dollars	Million Rhodesian pounds
Gold	20.0	7.10	20.2	7.23
Asbestos	16.8	6.00	19.2	6.85
Copper	9.0	3.23	11.6	4.16
Coal (sales)	8.6	3.08	9.6	3.43
Chromium ore	5.5	1.98	6.2	2.22
Other minerals	6.5	2.34	8.0	2.86

As can be seen from the preceding tabulation, both in 1963 and in 1964 gold and asbestos together accounted for more than 52 percent of the total value. This has been the situation for many years.

TABLE 3.—Rhodesia (formerly Southern Rhodesia): Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Antimony, content of concentrate	91	62	55	[r] 60	44
Arsenic, white	185	----------	1,095	549	187
Bauxite	----------	----------	508	1,842	2,478
Beryl	489	359	507	226	165
Cesium, pollucite	5	9	19	----------	24
Chromite	606,364	536,045	[r] 460,525	374,116	447,576
Copper:					
Mine, content of concentrate	[r] 13,724	13,828	[r] 13,740	16,773	16,639
Smelter, fire refined copper	----------	[r] 11,716	[r] 12,337	[r] 14,685	15,239
Gold ... troy ounces	562,703	570,095	554,647	566,277	575,386
Iron and steel:					
Iron ore ... thousand tons	158	388	619	655	824
Pig iron ... do	86	220	241	250	260
Ferrochrome [1] ... do	9	9	8	14	23
Steel ingots and castings ... do	86	92	80	50	[e] 50
Manganese ore	1,520	186	7,237	----------	145
Nickel, content of concentrate	22	58	78	119	173
Silver ... troy ounces	392,026	106,801	83,540	83,742	88,463
Tantalum concentrate ... kilograms	49,024	62,768	72,493	68,492	64,101
Tin:					
Mine, content of concentrates ... long tons	642	716	[r] 705	498	512
Smelter ... do	611	673	679	[r] 499	564
Tungsten ore and concentrate, 60 percent WO_3	10	50	22	2	----------
Nonmetals:					
Asbestos	121,529	146,609	128,997	129,051	139,208
Barite	----------	----------	----------	1,772	1,416
Cement ... thousand tons	[e] 443	279	[e] 250	[e] 250	[e] 250
Corundum	3,486	2,533	3,037	5,390	2,605
Diatomite, includes tripoli	149	371	384	273	315
Fire clay	16,704	14,640	13,910	13,180	12,455
Fluorspar	17	----------	18	311	70
Kaolin	6,000	18,494	----------	11,104	19,051
Kyanite	----------	----------	----------	54	233
Limestone	732,211	717,111	615,420	533,173	540,251
Lithium minerals:					
Amblygonite	----------	78	32	47	----------
Eucryptite	1,210	1,705	786	1,056	731
Lepidolite	14,048	21,806	19,272	14,657	20,813
Petalite	57,457	25,127	19,690	27,167	33,066
Spodumene	6,976	1,476	1,357	2,028	6,318
Magnesite	7,286	12,592	10,541	10,947	38,474
Mica:					
Block	41	29	15	26	34
Crude and scrap	342	46	79	103	71
Phosphate rock	3,493	454	----------	----------	1,995
Pyrite	50,089	59,379	51,265	66,099	82,431
Quartz	11,863	8,930	10,575	19,054	28,311
Quartzite	634	344	236	200	181
Semiprecious stones:					
Agate ... kilograms	----------	1,664	340	----------	----------
Amazonite ... do	----------	----------	----------	----------	66
Amethyst ... do	----------	----------	----------	901	288
Aquamarine ... do	----------	----------	----------	109	107
Chrysoberyl ... do	----------	(2)	10	16	15
Cordierite ... do	----------	----------	----------	1	4
Garnet ... do	----------	----------	----------	15	98
Jade ... do	2,721	1,814	2,721	1,814	3,629
Topaz ... do	----------	----------	----------	76	7
Tourmaline ... do	----------	----------	----------	57	3
Silica sand	----------	----------	----------	2,021	3,268
Talc	----------	----------	21	19	14
Mineral fuels:					
Coal, bituminous ... thousand tons	3,559	3,073	2,826	2,740	3,044
Coke ... do	146	192	102	[e] 105	130

[e] Estimate. [r] Revised.
[1] Exports.
[2] Less than ½ unit.

TRADE

According to available figures for visible trade (January to October),[3] Rhodesia would have a favorable balance of payments on current account in 1964.

---

[3] U.S. Consulate General, Salisbury, Rhodesia. Department of State Airgram A-533, Jan. 28, 1965.

The 10-month figures were imports, $256.7 million and exports, $338.8 million. The export total included $40.9 million in reexports, $16.2 million in net gold sales, and $9.8 million of Kariba power sent to Zambia that would be canceled out by an entry against Rhodesia since Kariba is jointly owned.

The trade pattern for these 10 months is given in the following tabulation:

Exports		Imports	
Country of destination	Value (million dollars)	Country of origin	Value (million dollars)
Zambia	[1] 92.7	United Kingdom	78.1
United Kingdom	89.6	Republic of South Africa	62.2
Republic of South Africa	28.3	United States	17.1
Malawi	13.2	Zambia	14.0
Other [2]	115.1	Other	85.4
Total	338.9	Total	256.8

[1] Includes $22.1 million of reexports and $9.8 million of Kariba power.
[2] Includes United States $7.3 million (6th in rank).

Rhodesian exports of raw minerals, refined copper, and gold bullion in 1964 were reportedly valued at $76.7 million, of which asbestos accounted for 36.6 percent, gold 28 percent, and copper 14.3 percent. Exports of chromite were valued at $7 million and of coal at $4.5 million. A feature of the year for exports was that 1 million tons of coal went to Zambia, where the copper companies both were increasing output and endeavoring to build up coal stocks.

In the first 10 months of 1964 asbestos, gold, and refined copper accounted for 14 percent of the value of all Rhodesian exports and reexports.

The trade agreement with Japan, which provides mutually most-favored-nation treatment, was reaffirmed to be effective until December 31, 1965. Rhodesia hopes that Japan will encourage importation of increasing quantities of Rhodesian primary products (perhaps particularly minerals) without too much emphasis on an equivalent increase in Rhodesian imports from Japan. In the first 11 months of 1964, the value of exports to Japan was $14.5 million and more than $11.2 million worth of Japanese goods entered Rhodesia. Rhodesia's mineral exports to Japan in 1964 included substantial quantities of iron ore, pig iron, ferroalloys, and asbestos.

The trade agreement signed with the Republic of South Africa became effective on December 1. This is expected to lessen somewhat Rhodesia's large adverse trade balance with the Republic.

Zambia, an important customer, announced she was unwilling to sign a trade agreement with Rhodesia.

With respect to imports of commodities of mineral origin, there was little change from previous years. For the most part they comprised refined petroleum products, iron and steel semimanufactures, nonferrous metals, and fertilizers. Imports of petroleum products and fertilizers should fall sharply in 1965, when a petroleum refinery and a superphosphate plant go on stream.

COMMODITY REVIEW

Metals.—*Antimony.*—Production of antimony concentrate, mostly a byproduct of the Sebakwe gold mine near Que Que, declined. But the steep increase in antimony prices caused by withdrawal of Chinese supplies from world markets resulted in reexamination of antimony occurrences around Que Que, Gwelo, and Gatooma. A new company, Rhodesian Antimony (Pvt.), Ltd., was formed to test a deposit at Que Que. A small pilot plant will be used; results will be known in 1965.

Chromium.—In mid-1964 the Ministry of Mines declared chromite mining a "depressed industry" and the cost of protecting claims was reduced by 50 percent, to $43.40 per claim per year. Both volume and value of production and exports nevertheless increased significantly and at yearend the outlook for the industry in 1965 appeared excellent.

Copper.—Compared with 1963 figures, the volume of Rhodesian copper production fell slightly, but the improvement in price that occurred during 1964 increased the value by 29 percent, to $11.6 million.

The Alaska smelter near Sinoia, controlled by the South African company, Messina (Transvaal) Development Co., Ltd., produced about 14,500 tons of fire-refined copper, of which around 11,800 tons was from the Mangula mine and 2,700 tons from the Alaska mine, both in Rhodesia and both controlled by Messina.

By yearend the stockpile of oxidized ore at the Mangula mine had reached 2 million tons averaging 1.15 percent copper. In July construction of a leaching plant to treat the ore began. It is expected to be operating by July 1965 and to leach 23,000 tons of ore a month.

As of September 30, 1964, Messina reported the proved ore reserves of its Rhodesian copper mines as follows:

Mine	Reserve		
	Metric tons	Percent copper	
		As oxide	Total
Umkondo	70, 550	1. 47	2. 32
Alaska	2, 073, 900	1. 11	2. 07
Mangula	14, 494, 000		1. 38

During the year a committee of the Rhodesian Parliament recommended that a study be undertaken of means by which Rhodesian copper production might be increased to a tonnage large enough for economic electrolytic refining in the country.

Gold.—The volume of gold production improved compared with that in 1963 but was 251,099 ounces lower than the 1940 record for Rhodesia of 826,485 ounces. Value of 1964 output, however, established a new record at $20.2 million, exceeding the previous record achieved in 1961 by $182,000.

Anglo American Corporation of South Africa, Ltd. (Anglo), through a subsidiary company, expanded prospecting activities in Rhodesia during the year. Systematic investigation of gold occurrences long known was undertaken. Options were taken on several gold mines with small output, and the mining assets of one of them, Felixburg Mines (Pvt.), Ltd., were purchased. In addition, Anglo built a modern cyanide plant at the Sabi mine near Shabani, a 6,000-ounce-a-year producer which Anglo acquired in 1963.

Iron and Steel.—In 1964 iron ore production again increased significantly, which again was largely due to increased takings by Japan, Rhodesia's only significant foreign iron ore market. As in 1963, three companies dominated export production. The largest exporter was Iron and Minerals Development (Pvt.), Ltd. (I.M.D.), a subsidiary of Kobe Steelworks Ltd. of Japan. I.M.D. operated the Beacon Tor mine near Que Que, which is expected to ship 300,000 tons a year as soon as the railroad can handle that quantity.

Belingwe Mining Investments (Pvt.), Ltd. (Belingwe), operator of the Norie claims in the Buhwa Mountain area, about 80 kilometers southwest of Fort Victoria, had contracts for ore deliveries to three Japanese companies. The ore reserves of Belingwe were estimated at 18 million tons, averaging 63 percent iron or more. The third company, Buchwa Mining Company (Buchwa), also in the Buhwa Mountain area, had a contract with the Japanese to deliver 350,000 tons by mid-1965. Iron content of this ore is about 65 percent. During the year Belingwe and Buchwa jointly built a 6.4-kilometer railroad spur to Ingezi siding on the main line to Lourenço Marques, Mozambique. The project reduced costs and increased transport capacity of both mines, but at yearend a shortage of railroad cars was still the limiting factor in shipping capacity.

Rhodesian Iron and Steel Company, Ltd. (RISCO), increased pig iron and steel production to around 350,000 tons and 140,000 tons, respectively, from about 250,000 tons and 50,000 tons in 1963. During the year RISCO decided to spend about $840,000 on new equipment. Major acquisitions will be a 500-ton hot metal mixer and a 160-ton crane; steel capacity will be increased by about 20 tons, to 110 tons per heat. April 1966 is the target date for completing the undertaking.

Tantalum and Cesium.—A major source of tantalite was again the Benson mine north of Mtoko (northeast of Salisbury), which produced about 18 tons of Ta_2O_5 in 1964. Benson hoped to increase Ta_2O_5 output by about 50 percent in the near future. Recent exploration at Benson resulted in discovery of a fairly large pollucite (cesium ore) body at a depth of about 60 meters.

A producer of Ta_2O_5 in 1964 probably somewhat larger than Benson was the Kamativi mine near Wankie, where tantalite is recovered as a byproduct of tin mining.

Tin.—While volume of tin production increased by only 14 long tons compared with 1963 tonnage, sharply higher prices prevailing in 1964 resulted in a 43-percent increase in value, to $1.7 million.

The only significant producer was again Kamativi Tin Mines, Ltd. (KTM), near Wankie, where peak annual output of 677 long tons occurred in 1962. Production since then has fallen because of an increase in tonnage of low-grade surface ore mined. Toward the end of 1964 the tonnage of ore mined underground was being increased. A vertical shaft 4.6 meters in diameter and 214 meters deep was completed in 1962 and at the end of 1964 an inclined shaft 1,159 meters long that will be connected with the vertical shaft on two levels was being completed. About 40,000 long tons of ore per month will be hoisted through the incline, and 8,000 to 12,000 tons per month through the vertical shaft. Mill capacity will be increased to 45,000 long tons of ore per month. This is only half of the capacity contemplated when the exploration campaign, which started in 1961, was undertaken and suggests that the goal of a 10-million-ton ore reserve had not yet been reached.

Nonmetals.—*Asbestos.*—Production of chrysotile asbestos increased in 1964 compared with that of 1963, both in quantity and value. Value in 1964 was at $19.2 million, $2.4 million higher than in 1963. Increased volume of over 10,000 tons was roughly equivalent to the production of the new Pangoni mine at Filabusi for which 1964 was the first full year of operation. Pangoni is expected ultimately to produce 27,200 tons of fiber annually, which would make it the third largest asbestos mine in Rhodesia, after Nil Desperandum and Gaths-and-King.

At the Swedish-controlled Ethel mine at Mtoroshanga northwest of Salisbury, the change from open-pit mining to underground mining was completed in 1964.

A small improvement occurred in the price obtained for asbestos exported despite strong competition, particularly from Canada and the U.S.S.R. Exports rose sharply and in 1964 were valued at $28 million, with shipments going to 53 countries. At yearend producers felt that demand would continue at a high level.

Emeralds.—An important deposit of emeralds was discovered in the Belingwe area of the Bulawayo Mining District in about 1957 and there has since been steady production although neither volume nor value is reported. Some of the stones are of the finest quality and have been established to equal or surpass the best material from Colombia.

Output in 1964 was almost entirely from the Zeus (Sandawana) mine, controlled by a subsidiary of the Rio Tinto Zinc Corp., Ltd. The larger and better quality Sandawana emeralds are to be cut locally by mid-1965. All foreign sales of cut emeralds will be handled through J. Rosenthal et Cie., Paris, France. This development indicated that Rio Tinto believes it has a large deposit.

An approximation of the value of Rhodesian emerald production in 1964 is possible because emeralds comprise the bulk of minerals produced that are officially reported under the heading "other." In 1964 this item was valued at $871,284.

Lithium Minerals.—Rhodesia remained the largest producer of lithium minerals in the world. Improved demand for the Rhodesian material that began late in 1963 continued strongly in 1964. The value of output was $1.3 million, compared with $917,000 in 1963. Exports nearly doubled and outran production. Exports to the United States, Belgium, and the United Kingdom were well above those in 1963.

The only significant producer, Bikita mine, bought additional equipment during the year. The mine is located east of Fort Victoria and is controlled by Selection Trust, Ltd., of London in which American Metal Climax, Inc., holds an interest.

Phosphates.—The Dorowa mine of African Explosives and Chemical Industries, Ltd. (Explosives), in the Sabi Valley, 60 miles west of Umtali, operated on an experimental basis from 1959 to 1961. It was closed when the then Federal Government of Rhodesia and Nyasaland declined to put a duty on imported phosphates large enough to insure profitable commercial operation. After dissolution of the Federation on December 31, 1963, the (Southern) Rhodesian Government applied restrictive duties on imports and in return Explosives agreed to reduce the wholesale price of single superphosphate $2.80 per short ton, to be wholly effective when Dorowa could meet the entire Rhodesian requirements. This will be before mid-1965. Explosives is building a $3.4 million flotation plant at Dorowa to produce annually 91,000 tons of phosphates, and it is enlarging its single and triple superphosphate Rodia plant at Msasa, just east of Salisbury. The major facility there will be a new sulfuric acid plant with annual acid capacity of 45,000 tons. The acid capacity of the existing plant is 63,000 tons. Cost of the project is $1.4 million. Surplus acid production of the facility will be used at the Mangula copper mine, where the new oxide leaching plant will be operating by mid-1965.

Pyrite.—Anglo American Corporation of South Africa, Ltd., conducted a diamond drilling campaign at its Iron Duke pyrite mine north of Salisbury and succeeded in establishing additional ore reserves of almost 1.4 million tons in a westward extension of the ore body. Measured reserves earlier were about 180,000 tons.

During the year, output increased on the strength of higher sales of pyrite for sulfuric acid manufacture by Explosives at Salisbury for copper smelting at Mangula.

Mineral Fuels.—*Coal.*—Coal sales totaled 2.8 million tons valued at $9.6 million, about 10 percent higher in quantity and value than in 1963. The increase reversed a steady decline from the peak of sales in 1957 of about 3.6 million tons. Factors contributing to the improvement included better business conditions, increased effort by Rhodesia Railways to haul coal, and to some extent active promotion of coal use for drying tobacco, and by Africans.

Exports of coal to Zambia, mostly for use by the copper companies, amounted to 907,000 tons, valued at $3.4 million, and represented 81.5 percent of total coal exports.

Throughout the year Wankie Colliery Co., Ltd., Rhodesia's only coal producer, held its domestic selling price of coal at $3.08 per short ton. This was despite mild general price inflation, the consumer price index rising about 3 percent compared with 1963.

Petroleum.—At yearend construction of the petroleum refinery at Umtali was on schedule. The facility is expected to go on stream in the first half of 1965.

SOURCE MATERIALS

The principal source for text in the Rhodesia section of the chapter was the Annual Minerals Report for Rhodesia for 1964 by William F. Keyes, Regional Minerals Officer, U.S. Consulate General, Johannesburg, Republic of South Africa, being Airgram A-373, May 6, 1965, of the Consulate General. Production and mineral export statistics for 1964 are also from that source. The principal source of foreign trade statistics for 1962 and 1963 was the Federation of Rhodesia and Nyasaland's Annual Statement of External Trade for 1963, compiled in the Trade Division of the Central Statistical Office, Salisbury.

ZAMBIA

In 1964 Zambia continued to have a monoeconomy. Copper mining, smelting and refining provided the major part of national income, government revenue and foreign exchange earnings.

Zambian mining industry did exceptionally well in 1964. Compared with 1963, its contribution to gross domestic product increased 3.2 percent to 49.9 percent, or by $65.5 million, and copper contributed 91 percent of the value of all domestic exports.[4]

Volume and value of 1964 copper production was respectively 11 and 19 percent higher than in 1963. The increase in value was the largest annual improvement recorded and was due to near capacity output and sharply higher prices for the metal. The volume of copper production at 642,315 tons was 15 percent of non-Communist world production and ranked Zambia second after the United States among free world copper producers.

The outstanding event of the year was the acquisition by the new Zambia Government of mineral rights held by British South Africa Co. (BSA), which covered most of Zambia including the Copperbelt. The consideration was $5.6 million paid by Zambia; BSA also received the same amount from the British Government ex gratia.

At yearend discussions were in progress between the Zambia Government and the Copperbelt companies regarding royalty payments to the Government. Royalties paid to BSA had been on the basis of the quantity of copper produced and were related to London Metal Exchange copper prices, not to prices at which copper was actually sold. There were indications that a new scheme might be agreed upon that would take into account the grade of ore mined. The outcome of the negotiations will influence the future availability of new capital for mining ventures in Zambia.

Zambia income tax applicable to the copper companies was increased during 1964 from 40 percent to 47.5 percent.

Estimated employment in mining and quarrying increased compared with 1963. African employment rose 1,900 to 43,300 at yearend and non-African by 190 to 8,290. Companies nevertheless were concerned about the danger of losing non-African employees before qualified Africans are available to replace them. Apprentice Africans will undergo up to 3 years of training in schools at the mines; concurrently they will attend a new Northern Technical College for theoretical work.

In August the mining companies proposed establishment of separate terms of employment for non-Africans and Africans, following acceptance of the principle by the Government for employment in the Civil Service. The two unions representing primary non-African employees agreed to the proposal. The new terms for non-Africans included consolidation of the old copper bonus into salaries at 21 percent of basic pay, and a Christmas bonus of 5 percent, contracts for all employees, and compensation for loss of employment resulting from Zambianization of the job. New non-African employees will be hired on fixed-term contracts.

For Africans, an agreement was reached with the Zambia African Mineworkers Trade Union on a new wage structure. A monthly contract and a wage increase of US$0.175 per shift were established. Discussions with the union were begun on consolidating the old copper bonus into wages at 29 percent of basic wages.

---

[4] Republic of Zambia, Ministry of Finance (Lusaka). Economic Report, 1965. Pres. to National Assembly, 1965, pp. 11, 34.

The following major changes in names and head office locations of companies with interests in Zambia were made during the year or early in 1965 so as to take into account the new political situation: Rhodesian Selection Trust Ltd. became Roan Selection Trust Ltd. (RST) and moved its head office from Salisbury to Lusaka, capital of Zambia. The Roan Antelope Division of RST became the Luanshya Division. Companies controlled by Anglo American Corporation of South Africa Ltd. changed their names as follows: Rhodesian Anglo American Ltd. became Zambian Anglo American Ltd. and moved its head office to Lusaka; Rhodesia Copper Refineries Ltd. became Rhokana Copper Refineries Ltd.; and Rhodesia Broken Hill Development Co. Ltd. became Zambia Broken Hill Development Co. Ltd.

GOVERNMENT POLICIES AND PROGRAMS

The speech of the Minister of Finance introducing the July 1964 budget includes the following statements (paragraphs 129 and 203) concerning the position of the Zambia Government with respect to mineral royalties and taxation:

Paragraph 129—

> When we get the mineral royalties back, it would be the Government's intention to hold discussions with the copper mining companies on the best way in which to obtain from them a payment in respect of their extraction of our natural resources. Such an arrangement must take account of the revenue needs of the country and of the economics of the mining industry and its needs for capital for further development. I would not expect the present mineral royalty system to continue in its existing form. The computations of the royalty payments by reference to the London Metal Exchange prices is clearly inappropriate while the metal mined here is sold at fixed contract prices. Moreover, as I have mentioned, the mineral royalty arrangements should take account of the fact that some deposits are less profitable than others. What we should aim to achieve is an agreement with the mining companies under which they will undertake to plan and finance a vigorous programme for production in the Territory, and to contribute a reasonable part of their returns from sales to Government revenues as payment for the extraction of our natural resources. This should be under a system that fits in with orderly and efficient production. It should leave with the companies a fair proportion of their income. After income tax has been paid, an appropriate part should be ploughed back to finance the agreed targets for production and an appropriate part should be distributed to the shareholders of the company wherever they may be.

Paragraph 203—

> In making this substantial increase in the income taxation of the large companies, including, of course, the British South Africa Company, I would like to emphasize that my object is not to impose heavy taxation on prosperous enterprises in the country * * * I would have preferred to obtain this return from other arrangements and hope to be able to do so in consultation with the mining companies after the mineral royalty question has been settled. It should be possible to differentiate more clearly between payment by the mining companies for the natural resources they exploit and the taxation for the profits that they subsequently obtain from their enterprise in adding value to those resources and selling them. I therefore regard this large increase in the higher rate of company tax as purely a temporary measure and hope that in next year's budget I shall be able to announce more satisfactory permanent arrangements.[5]

---

[5] RST Group of Companies' Statement by the Chairman, Sir Ronald L. Prain, to accompany the Directors' Report and Accounts for the year ended June 30, 1964, p. 4.

As noted earlier, the Zambian Government accepted the principal that the Civil Service would establish separate terms of employment for non-Africans and Africans.

In December a bill was introduced in the National Assembly under which no aid to trade unions from sources outside Zambia could be accepted without the explicit approval of the Government.[6]

PRODUCTION

The value of mineral production was $418.3 million in 1964, compared with $350.4 million in 1963. From the following tabulation it is evident that copper is the backbone of the Zambian mining industry.

Commodity	Value of mineral production (million dollars)	
	1963	1964
Copper	330.5	392.2
Zinc	9.4	14.4
Cobalt	3.1	4.4
Lead	3.1	3.2
Other minerals	4.3	4.1
Total	350.4	418.3

TABLE 4.—Zambia (formerly Northern Rhodesia): Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Beryl	2				(1)
Cadmium ... kilograms	26,400	[r] 18,912	16,859	14,993	14,631
Cobalt:					
Metal	976	689	727	682	1,345
Other forms, cobalt content	871	854	136	24	63
Total	1,847	1,543	[r] 863	[r] 706	1,408
Copper:					
Concentrate, copper content	74	97	64	68	68
Blister	164,495	151,208	113,743	137,121	145,431
Electrolytic	402,131	416,280	433,292	438,893	496,884
Other	1,220	1,449	718	836	[p] 531
Total	567,920	569,034	547,817	576,918	642,914
Gold [2] ... troy ounces	6,300	4,192	3,625	4,960	[p] 5,033
Lead, refined	14,661	[r] 15,421	14,826	19,610	13,161
Manganese ore	[r] 53,795	[r] 53,086	46,721	35,250	38,010
Selenium [3] ... kilograms	22,734	[r] 17,369	18,382	28,527	[p] 26,141
Silver [4] ... troy ounces	920,601	738,558	697,054	883,681	[p] 977,978
Tin concentrate, tin content ... long tons		1	8	1	[p] 8
Vanadium, metal		236			
Zinc, electrolytic	30,271	30,340	[r] 40,439	[r] 49,451	46,712
Nonmetals:					
Amethyst ... kilograms	2	4,508	12,664	15,443	[p] 6,714
Cement ... thousand tons	[e] 127	122	[e] 120	[e] 120	170
Limestone	366,029	423,335	460,055	538,679	567,146
Mica, sheet ... kilograms					[p] 1,499
Phyllite	10,714	21,129	16,376	13,026	11,268

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Less than unit applicable.

[2] Chiefly contained in electrolytic copper refinery muds and blister copper.

[3] Contained in electrolytic copper refinery muds and blister copper.

[4] Refined silver and silver contained in electrolytic copper refinery muds and blister copper.

---

[6] The African-American Institute, Inc., Washinngton, D.C., Africa Report, Feb. 15, 1965, p. 56.

TRADE

The balance of visible trade payments was highly favorable in 1964, and terms of trade improved as a result of increasingly favorable prices for copper specifically and for Zambia's mineral products generally. Imports, reexports, and domestic exports were, respectively, $219.0 million, $12.1 million, and $457.6 million, resulting in a favorable balance of visible trade of $250.7 million. Refined copper accounted for $415.4 million of domestic exports and other mineral commodities were valued at $25.7 million.

The United Kingdom and countries of Continental Europe continued to be by far the largest markets for Zambian exports, taking respectively 32 and 36 percent of total exports and reexports in 1964. Other important markets were Japan (11 percent), Republic of South Africa (8 percent), and Rhodesia (4 percent). Exports to the United States in 1964 amounted to $12.5 million and to Communist countries $11.4 million.

The import most vital to the Zambian economy continued to be industrial explosives and blasting accessories, which Zambia does not manufacture. More than 99 percent of such imports come from the Republic of South Africa and in 1963 comprised 20,936 tons of prepared explosives valued at $4.4 million and blasting accessories valued at $2.0 million. In 1964 other imports almost all or all of which were for the mineral industry included mineral fuels and electricity as well as machinery and transport equipment, valued at $24.4 million and $59.4 million, respectively.

Zambia imports as a whole in 1964 originated as follows:[7]

Source:	*Value (million dollars)*
Sterling area:	
Southern Rhodesia	86.4
South Africa, Republic of	45.8
United Kingdom	37.6
Other	6.7
Total	176.5
Dollar area:	
United States	11.2
Canada	2.1
Other	0.1
Total	13.4
Rest of the world:	
Other European countries	16.0
Republic of the Congo (Léopoldville)	1.5
Portuguese African territories	0.5
Other	10.4
Total	28.4

COMMODITY REVIEW

Metals.—*Copper and Cobalt.*—The copper mining industry returned to a policy of full production early in 1964. Except for a Zambian railroad strike in August, Zambian industry was not seriously affected by work stoppages during the year and established a new record.

---

[7] Parcels individually valued at less than $28 are omitted.

Preliminary figures for value of blister copper and electrolytic copper produced were respectively $83.0 million and $308.8 million, compared with $74.4 million and $255.9 million in 1963. For cobalt, value of production increased to $4.4 million from $3.1 million.

The increase in value of copper output in large part resulted from rising copper prices. In January 1964, the Zambian companies offered to sell copper to their customers at approximately the equivalent of 29.5 cents per pound (£236 per long ton) instead of on the basis of the higher and erratic London Metal Exchange settlement price. In March, the price to customers was increased by the companies to 30.5 cents per pound (£244 per long ton) and in August to 32.5 cents per pound (£260 per long ton).

In 1964 the Anglo American Corporation Ltd. controlled and administered in Zambia Rhokana Copper Refineries Ltd. as well as the following operating copper mining companies: Bancroft Mines Ltd. (financial year ends June 30); Nchanga Consolidated Copper Mines Ltd. (year ends March 31); and Rhokana Corp. Ltd. (year ends June 30).

The combined copper production of the mining companies was 354,109 tons in 1963–64. This was approximately 56 percent of the total Zambian copper production in calendar year 1964 and about 8 percent of non-Communist world copper production.

Bancroft Mines Ltd. contributed 33,169 tons of finished copper to group production in the financial year which ended June 30, 1964. In doing so the company suffered a loss of $4.6 million after taking into account $3.5 million of capital expenditure for maintaining, not increasing, output. The severely leached zone encountered during the previous year turned out to be even more extensive than originally believed. Mud rushes occurred in two dewatering crosscuts on the 335-meter level and only 100,000 tons of ore monthly could be mined from both shafts. This situation will exist for some time.

During the year Nchanga Consolidated Copper Mines Ltd. offered to acquire the entire ordinary (common) stock of Bancroft not already held by Nchanga, by exchange of one fully paid Nchanga $2.80 share for every six Bancroft stock units of 70 cents each. Holders of 98.2 percent of Bancroft stock accepted the offer and the deal ultimately was concluded.

Nchanga Consolidated Copper Mines Ltd. (Nchanga) was the world's fourth largest copper producer in 1964, after The Anaconda Company, Kennecott Copper Corp., and Union Minière du Haut Katanga in the Republic of the Congo (Léopoldville). Nchanga in the year ended March 31, 1964, achieved a record output of 212,208 tons of finished copper, 14,225 tons more than the previous record realized in 1961–62. Sales amounted to 203,090 tons. Net profit after providing for taxation was $31.4 million, compared with $30.4 million in 1963 and $35.8 million in 1962. Dividends totaling approximately the equivalent of 94.5 cents per stock unit were paid, compared with 98 cents in 1963, according to the company,[8] the lower dividend is attributable to the necessity of providing an additional $3.9 million for taxation. Capital expenditure in 1964–65 was expected to be about $14 million, of which $9.8 million will be spent to increase production from open pits. The pits will be the major source of ore to be sent to Bancroft for milling. The total capital expenditure was expected to increase Nchanga production of copper in 1965 and 1966 by more than 100,000 tons.

---

[8] Anglo American Corp. of South Africa Ltd. Annual Report 1964, p. 72.

Rhokana Corp. Ltd. produced 108,731 tons of finished copper in the year ended June 30, 1964, about 9,200 tons more than in the previous year. The improved output was primarily the result of improved recovery by the concentrator and increased tonnage of ore mined. Cobalt production at 951 tons was 320 tons less than in 1962–63. The cobalt plant was shut down from April until October of 1964 for major overhaul and for modifications to improve performance.

At June 30, 1964, major investments of Rhokana included substantial holdings in Zambia copper mining companies administered by Roan Selection Trust Ltd. (RST) as follows:

RST Company:	*Rhokana interest (percent)*
Chambishi Mines Ltd. (£1 shares)	26.68
Chibuluma Mines Ltd. (£1 shares)	26.68
Mufulira Copper Mines Ltd. (£1 shares)	26.56

Rhokana Copper Refineries Ltd. increased production of electrolytic copper during the year to 248,744 tons, compared with 236,975 tons in the previous year. The improvement was primarily due to casting a large tonnage of cathodes received from the low-grade oxide section of the Nchanga leach plant.

The financial year of Roan Selection Trust Ltd. (RST) and of its subsidiary companies in Zambia ends June 30. In the year ended June 30, 1964, the copper production of RST's wholly owned Roan Antelope Mine and the subsdiary operating mining companies in Zambia totaled a record 274,543 tons, compared with 211,641 tons in 1962–63. Ore reserves as of June 30, 1964, for operating and other properties were reported as follows:

Property:	*Ore reserves (thousand metric tons)*	*Percent copper*
Roan Antelope	87,756	2.91
Mufulira	157,692	3.33
Chibuluma	8,179	[1] 4.54
Chambishi (developing)	32,000	3.37
Baluba (undeveloped)	102,000	[2] 2.41
Total	387,627	

[1] Plus 0.14 percent cobalt.
[2] Plus 0.16 percent cobalt.

Roan Antelope Mine produced 94,021 tons of copper in 1963–64, the largest annual output since operations began in 1931. Gross profit for the year was $9.5 million, an increase of $1.4 million from the previous year. Copper deliveries totaled 97,960 tons, nearly 17,300 tons more than in 1963.

Mufulira Copper Mines Ltd., second largest Copperbelt mine after Nchange, increased copper output to a record 156,568 tons, from 110,152 tons in 1963, when Mufulira was struck for 10 weeks. The electrolytic refinery will be enlarged, by late 1965, to handle 165,000 tons of blister copper annually, enough to take all Mufulira blister copper. At the end of the year, Mufulira had 10,253 employees, compared with 9,583 on June 30, 1963.

Chibuluma Mines Ltd. produced 23,953 tons of copper for fire refining at Mufulira and Roan Antelope. The output was more than 8,100 tons higher than in the previous financial year. At the main Chibuluma ore body the Norrie shaft was extended from the 476-meter level to the 517-meter level and was concreted to the 503-meter level. Output of cobalt-copper concentrate amounted to 18,570 tons. Cobalt-copper matte produced at the cobalt plant at Ndola totaled 1,523 tons. The plant was closed during February for economic reasons, and cobalt-copper concentrate produced thereafter was stockpiled. Other schemes for treating the concentrate were being investigated, including the use of metallurgical facilities at the new Chambishi mine.

Chambishi Mines Ltd. expected to begin production during the 1964–65 financial year, although plant construction was behind schedule at the end of June 1964. Planned output is 26,400 tons of copper annually, 1,000 tons more than originally estimated, however, this figure will not be reached until the 1966–67 financial year.

Ndola Copper Refineries refined 106,875 tons of copper during the year, compared with 90,951 tons the previous year. Gross profit amounted to $1.8 million. Charges for depreciation and taxes were respectively $347,000 and $378,000. A gross dividend of 28 cents per share was recommended.

Lead and Zinc.—Output of lead and zinc by Zambia Broken Hill Development Co. Ltd., the only producer of the metals in Zambia, was lower than in 1963, particularly the output of lead. Major reasons for the decline were failure of the Imperial Smelting Furnace, installed in 1962, to operate at the efficiency expected; a mine strike in February and March 1964; and a rail strike in August, which held up coke deliveries from Wankie. Target output for 1965 was set at 71,000 tons of combined lead and zinc, and ultimate annual output was set at 86,000 tons.

MALAWI

The statistical offices of the ministries of the Government of the new Republic of Malawi did not open and begin to function until toward the end of 1964. Largely as a result, statistics of Malawi's nominal mineral production were unavailable for 1964 with two exceptions: Cement output, at Blantyre, was reported as 27,689 tons valued at $968,000; production of building stone was reported as 20,504 cubic meters valued at $77,000. Other mineral production, if any, was negligible.[9]

A report of the Malawi Geological Survey that was in the process of being printed at the end of 1964 describes the monazite deposit at Kangankunde Hill and mineral processing undertaken on the ore. Trial lots of strontianite, which also occurs in the Hill, were requested by two companies and concentration tests were undertaken both at Warren Springs Laboratory, Stevenage, United Kingdom, and at the deposit.[10]

Further pitting of the bauxite deposit on Mlange Mountain confirmed the 60 million tons of bauxite originally found.[11]

---

[9] U.S. Consulate General, Johannesburg, Republic of South Africa. Department of State Airgram A–400, May 20, 1965.

[10] Mining Journal (London). Mining. Annual Review 1965. May 1965, p. 188.

[11] Work cited in footnote 10.

The Photogeological Division of the Overseas Geological Survey, London, undertook mapping in parts of Malawi during 1964.[12]

Of four coalfields known in Malawi, the Nkana field at Nkana in the Songwe River area of Karongo district appeared to offer the greatest possibilities for commercial exploitation, although its estimated reserve is only 14 million tons of medium-quality workable coal. The field is part of a larger coalfield in adjacent Tanzania. The Nkana coal is shallow and less faulted than that in other Malawi coalfields.[13]

The principal sources for the Malawi section of this chapter were Department of State Airgram A–182, April 9, 1965, of the U.S. Embassy, Blantyre, Malawi, as well as Mining, Annual Review, 1965, published by the Mining Journal, London, May 1965.

---

[12] Work cited in footnote 10.
[13] U.S. Embassy, Blantyre, Malawi. Department of State Airgram A–182, April 9, 1965.

The Mineral Industry of Senegal

By William C. Henkes[1]

⁂

THREE significant events occurred in the mineral industry of Senegal in 1964: Greatly increased phosphate production and exports, opening of the Dakar petroleum refinery, and diminution of beach sand mining. The first two events greatly helped the Senegal balance of trade. Production of calcium phosphate increased 44 percent over that of 1963, and exports more than doubled.

The economy remained fairly stable during the year; an increase in industrial production of about 6 percent was attributed almost entirely to increased phosphate production. The gross national product (GNP) for 1963 was $674 million,[2] an increase of 17 percent over that of 1962. Mineral production, valued at about $13 million, continued to account for about 2 percent of the GNP.

On January 27, 1964, a new refinery at M'Bao, near Dakar, was formally opened. It is owned and operated by Société Africaine de Raffinage, an association of French, American, British, and Dutch oil companies and the Banque Sénégalaise de Développement.

GOVERNMENT POLICIES AND PROGRAMS

In September 1964 a trade agreement was signed with Brazil calling for increased shipment of fish, peanuts, phosphate, zircon, ilmenite, fertilizers, and cement to Brazil and foodstuffs, cotton, sisal, and office equipment from Brazil.

PRODUCTION

Mineral production in Senegal in 1964 continued the trends established in recent years: An irregularly declining output of ilmenite, rutile, and zircon; a slow, steady increase in output of cement and salt; and a rapid increase in calcium phosphate output. The great increase in production of calcium phosphate was largely the result of successful marketing efforts of Compagnie Sénégalaise de Phosphates de Taiba and its U.S. stockholder, International Minerals and Chemical Corp.

---

[1] Petroleum engineer, Division of International Activities.

[2] Where necessary, values have been converted from the African Financial Community franc (CFAF) at the rate of US$1=CFAF245.

TABLE 1.—Senegal: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Titanium concentrate:					
Ilmenite	21,917	17,496	22,432	12,189	[1] 3,970
Rutile	----------	170	736	736	[1] 128
Zirconium concentrate	10,349	5,388	2,336	3,069	[1] 928
Nonmetals:					
Cement ... thousand tons	168	182	183	190	205
Phosphate rock:					
Aluminum phosphate	105,292	139,380	141,426	[r] 125,778	120,939
Calcium phosphate	107,686	406,969	497,090	[r] 469,872	677,081
Salt [2] ... thousand tons	50	44	48	60	56
Mineral fuels:					
Petroleum:					
Crude	1,626	2,242	463	----------	----------
Refinery products:					
Gasoline	----------	----------	----------	3,481	73,390
Kerosine and jet fuel	----------	----------	----------	665	26,580
Distillate fuel oil	----------	----------	----------	3,430	68.860
Residual fuel oil	----------	----------	----------	3,263	105,690
Asphalt and bitumen	----------	----------	----------	----------	----------
Other	----------	----------	----------	----------	26,025
Total	----------	----------	----------	10,839	300,545

[r] Revised.
[1] Exports.
[2] Includes production of Mauritania, estimated at 500 to 800 tons per year.

TRADE

Exports of the major mineral and metal commodities in 1963 were valued at $7.0 million, compared with 1962 exports of $7.7 million; in both years these commodities comprised about 6 percent of total exports. Calcium phosphate constituted two-thirds by value of the mineral and metal exports. Because of a large increase in phosphate exports, the value of 1964 mineral exports should show great improvement.

France was the major destination of total 1963 exports, receiving commodities valued at $95.3 million or 85.6 percent of the total exports. West Germany was second with $2.3 million of commodities, of which

TABLE 2.—Senegal: Major exports of metals and minerals

(Metric tons)

Commodity	1962	1963	Principal destinations, 1963 [1]
Metals:			
Copper, scrap	625	612	France 223; Italy 191; West Germany 75.
Iron and steel, scrap	10,103	11,269	Mainly to Japan.
Titanium concentrates	22,962	13,877	France [2] 14,862.
Nonmetals:			
Fertilizers, phosphatic [3]	32,810	13,578	All to France.
Phosphate rock:			
Aluminum phosphate	110,920	49,385	NA.
Calcium phosphate	342,043	346,257	West Germany 156,277; France 117,445.
Salt	12,408	43,302	NA.

NA Not available.
[1] Derived mainly from Foreign Trade Statistics, Analytical Tables, Imports, 1963, 422 pp., August 1964, published by the Statistical Office of the European Communities, Brussels, Belgium.
[2] Includes zirconium ore not reported as export by Senegal.
[3] Includes dehydrated aluminum phosphate and products marketed under trade names of Baylifos, Polyphos, and Phospal.

$2.1 million was for calcium phosphate. The Cameroons and Norway ranked third and fourth as customers.

France also was the principal source of Senegalese imports in 1963: $99.3 million out of $157.3 million. Value of minerals and metals imported totaled $15.2 million, of which $8.4 million was for refined petroleum products. Unspecified base metals accounted for $5.5 million.

West Germany ranked second in providing imports with a value of $7.4 million (4.7 percent). The United States, ranking third, furnished $5.7 million worth of imports.

TABLE 3.—Senegal: Major imports of metals and minerals

(Metric tons)

Commodity	1962	1963	Principal sources, 1963[1]
Metals: Unspecified	36,803	33,246	Mainly from France.
Nonmetals:			
Building materials, unspecified	3,705	8,327	Do.
Cement	525	2,769	France 659.
Fertilizers	16,711	15,553	France 5,661; West Germany 3,627.
Salt	105	[2] 118	France 117.
Mineral fuels:			
Solid fuels and derivatives	498	631	NA.
Petroleum refinery products:			
Gasoline	76,965	72,103	Italy 27,420; France 8,433.
Kerosene	12,522	18,569	Netherlands 80,283; France 51,837; Italy 44,557.[3]
Distillate fuel oil	20,533	17,036	
Residual fuel oil	143,234	148,901	
Asphalt and bitumen	5,629	6,172	NA.
Others	7,438	6,648	France 4,915.
Total	266,321	269,429	

NA Not available.

[1] Statistical Office of the European Communities, Brussels, Belgium, Foreign Trade Statistics, Analytical Tables, Exports, 1963. November 1964, 759 pp.

[2] From European Economic Community only.

[3] Subdivision by EEC does not agree with that of Bulletin Statistique et Économique Mensuel, Dakar, Senegal.

COMMODITY REVIEW

METALS

Ilmenite, Rutile, and Zircon.[3]—The Service des Mines made evaluation studies of the mineral-bearing beach sands along the coast north of Dakar. These studies indicated estimated reserves of more than 5 million tons of ilmenite, 100,000 tons of rutile, and 600,000 tons of zircon. The Government made efforts to interest mining companies in these deposits.

The Société Minière Gaziello et Compagnie operated facilities in similar beach deposits south of Dakar, but the high chromium content of the ores made the feasibility of continuing operations doubtful.

NONMETALS

Phosphate Rock.—Phosphate rock continued to be the principal mineral product in value and quantity; in 1963, this commodity accounted for 75 percent ($5.28 million) of the mineral exports.

---

[3] U.S. Embassy, Dakar, Senegal. Airgram A-294, Feb. 18, 1965.

The Compagnie Sénégalaise de Phosphates de Taiba, the producer of calcium phosphate, greatly improved its position in 1964, largely owing to the efforts of the U.S. company, International Minerals and Chemical Corp., a large Taiba stockholder. Output of marketable phosphate in 1964 increased by 44 percent to about 677,000 tons, valued at more than $8.2 million. At yearend, concentrator capacity was being increased to 1 million tons annually, and output at that rate was expected to be reached by mid-1965. Exports in 1964 were 712,870 tons, which went to eight countries: The principal destinations were West Germany (217,164 tons), Japan (154,671 tons), and the United Kingdom (143,894 tons).[4]

The Compagnie de Produits Chimiques et Électrométallurgiques Péchiney produced 121,000 tons of aluminum phosphate valued at $1.2 million. Exports totaled 19,500 tons of which 18,000 tons were clinker phosphate which went to France. Péchiney in Senegal was the world's only producer of aluminum phosphate.[5]

MINERAL FUELS

Petroleum.—The Compagnie des Pétroles Total (Afrique Ouest) (COPETAO) continued exploration of its permit area covering 21,340 square kilometers both onshore and offshore along the coast between Gambia and Portuguese Guinea. The company announced plans for an offshore drilling program beginning in the summer of 1965; drilling is to be done by Foramer, a concern formed by French, Belgian, and Dutch interests. The drilling platform was being built in the Netherlands.[6]

Operations commenced at a 600,000-ton-per-year (12,000-barrel-per-day) refinery at M'Bao, near Dakar, at the beginning of the year and was expected to improve the Senegal foreign trade balance by about $2 million per year.

During 1964, the refinery received 269,336 tons of crude oil. The crude was from Hassi Messaoud field, Algeria (129,335 tons); Rhourde El Baguel field, Algeria (24,331 tons); Manji field, Gabon (111,311 tons); domestic stocks 4,359 tons. Output of refinery products was 300,545 tons.

SOURCE MATERIAL

Production data for Senegal were furnished by the U.S. Embassy, Dakar, and most trade data are from the periodical "Bulletin Statistique et Économique Mensual," issued by the Service de la Statistique. The principal sources and destinations of the imports and exports have been derived from "Foreign Trade Statistics, Analytical Tables, Exports and Imports, 1963," published by the Statistical Office of the European Communities, Brussels, Belgium.

---

[4] U.S. Embassy, Dakar, Senegal. Airgram A-321, Mar. 7, 1965.

[5] Work cited in footnote 4.

[6] Petroleum Management. V. 36, No. 6, June 1964, p. 96. Petroleum Press Service. V. 31, No. 12, December 1964, pp. 474-475.

The Mineral Industry of Sierra Leone

By Eric Ho [1]

◆

MINERAL production continued to be of prime economic importance to Sierra Leone. This country remained one of the top three along with South-West Africa and South Africa, in terms of the value of diamond production in the world. It was expected to be the second biggest producer of rutile in 1966, surpassed only by Australia.

In 1963 and 1964 mineral exports accounted for about 84 percent of total domestic exports. Despite the lack of mineral fuels, the value of Sierra Leone's mineral exports exceeded that of mineral imports by \$51.3 [2] million in 1963, against a deficit of \$2.6 million on total trade balance. Mineral exports were therefore an important contributor to foreign exchange.

In 1963 mining companies employed 7,552 persons with 286 occupying supervisory positions, an increase of 9 percent over 1962. In addition an average of 28,043 persons were engaged in small diamond digging. In the predominantly agricultural economy, this represented a large proportion of the nonagricultural employment.

GOVERNMENT POLICIES AND PROGRAMS

The Government of Sierra Leone continued its policy of attracting private investors through tax and tariff exemptions. In March 1964 the government reduced the Commonwealth tariff preference by half, thus placing all supplying countries on a more competitive position. Complete abolition of Commonwealth preference in the near future was indicated. The Government continued programs for road construction, electric power installations, and telecommunication systems. In addition Africanization of mining, manufacturing, and commerce remained constant objectives of the Government. In August 1964, a new currency, the leone was introduced. The rate of exchange was 2 leones equal 1 West Africa pound.

---

[1] Public Affairs fellow, Brookings Institution.

[2] Where necessary, values have been converted from the Leone (Le) and West African pound (WA£) at the rates of Le1=US\$1.40 and WA£1=US\$2.80.

PRODUCTION

The value of minerals produced in 1964 was estimated at $65 million, an increase of 33 percent over 1963. As usual, diamonds provided about 76 percent of total value; iron ore about 23 percent.

TABLE 1.—Sierra Leone: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Bauxite……thousand tons	----------	----------	----------	20	151
Chromite	5,464	----------	11,450	2,782	----------
Gold……troy ounces	----------	22	30	[1] 44	----------
Iron ore……thousand tons	1,470	1,695	1,873	1,912	1,993
Nonmetals:					
Diamonds:[2]					
Sierra Leone Selection Trust thousand carats	[r] 702	[r] 797	[r] 716	664	663
Small operators……do	[r] 1,216	[r] 1,406	[r] 1,034	639	780
Total……do	[r] 1,918	[r] 2,203	[r] 1,750	[r] 1,303	1,443

[r] Revised.

[1] Exports.

[2] Production of Sierra Leone Selection Trust for fiscal year ending June 30 basis. Purchases of small operators' production by the Government Diamond Office on a calendar year basis.

TRADE

Despite the lack of mineral fuels, Sierra Leone again had a favorable balance of trade insofar as metals, minerals, mineral fuels, and semimanufactures of mineral origin were concerned. Salient statistics on trade in 1963 were as follows:

TABLE 2.—Sierra Leone: Salient statistics on trade, 1963

	Value, million dollars		
	Exports and reexports	Import	Balance[1]
Metals and minerals	59.4	5.7	+53.7
Petroleum	7.9	10.3	−2.4
Total, mineral trade	67.3	16.0	+51.3
Other commodities	13.7	67.6	−53.9
Total, all trade	81.0	83.6	−2.6

[1] Positive numbers indicate surpluses, negative numbers indicate deficits.

Diamonds accounted for 76 percent of the metals and minerals export value. Diamonds produced by Sierra Leone Selection Trust, Ltd. in 1962 and completely withheld from export that year were partly exported in 1963. The United Kingdom was the prime recipient of Sierra Leone mineral exports. Petroleum products accounted for more than 65 percent of the total mineral import value; most of these products came from the Netherlands, the Netherlands West Indies, Venezuela, and Trinidad.

TABLE 3.—Sierra Leone: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Bauxite________thousand tons__	----------	20	West Germany 10; Italy 10.
Chromite________	9,507	8,840	All to United Kingdom.
Iron ore:			
Fines________thousand tons__	108	140	All to Netherlands.
Concentrates________do____	1,906	1,844	Netherlands 669; United Kingdom 549; West Germany 506.
Ferromax[1]________do____	1	1	Mainly to West Germany.
Total________do____	2,015	1,985	
Nonmetals:			
Diamonds:			
Government Diamond Office thousand carats__	1,158	649	All to United Kingdom.
Sierre Leone Selection Trust________do____	----------	1,089	Do.
Total________	1,158	1,738	
Mineral fuels:			
Petroleum refinery products (reexports):			
Gasoline______thousand 42-gallon barrels__	4	4	All to bunkers.
Jet fuel________do____	4	16	Do.
Kerosine________do____	11	(2)	Do.
Distillate fuel oil________do____	633	505	Do.
Residual fuel oil________do____	1,285	1,246	Do.
Total________do____	1,937	1,771	

[1] Trade name for specularite largely for use as pigments.
[2] Less than 0.5 of unit.

Source: Sierre Leone Trade Report, Government Printing Department.

TABLE 4.—Sierra Leone: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum semimanufactures	91	125	United Kingdom 44; Belgium 28; Nigeria 18; Switzerland 15.
Copper semimanufactures	144	50	United Kingdom 49.
Iron and steel semimanufactures	26,469	23,424	United Kingdom 18,156; Japan 3,089; Belgium 1,409.
Lead, ingots and semimanufactures	46	36	United Kingdom 14; Belgium 13.
Silver, unwrought and semimanufactures ... troy ounces	3,450	6,936	All from United Kingdom.
Tin, all forms ... long tons	8	1	Do.
Zinc, all forms	3	2	United Kingdom 1; Belgium 1.
Nonmetals:			
Cement	62,381	68,338	Poland 22,827; United Kingdom 19,529; East Germany 9,525.
Fertilizers, mineral	453	2,248	United Kingdom 394; East Germany 381; Israel 380; Tunisia 380.
Lime	241	673	United Kingdom 669.
Salt	6,463	8,860	United Kingdom 8,394; Spain 251.
Mineral fuels:			
Coal, coke, and briquets	15,868	4,523	United States 4,470.
Gas, natural and manufactured	58	87	Netherlands 33; United Kingdom 31.
Petroleum refinery products:[1]			
Gasoline ... thousand 42-gal. barrels	207	205	Italy 60; Netherlands West Indies 60; France 27.
Jet fuel ... do	7	16	Netherlands 9; Netherlands West Indies 4.
Kerosine ... do	120	104	Netherlands West Indies 35; Italy 29; Trinidad 14.
Distillate fuel oil ... do	1,187	977	Netherlands 309; Netherlands West Indies 201.
Residual fuel oil ... do	1,232	1,188	Netherlands 486; Venezuela 231; Trinidad 214.
Lubricating oil ... do	18	18	Netherlands 9; United Kingdom 6.
Total ... do	2,771	2,508	
Asphalt	2,979	5,780	United Kingdom 4,492; Canary Islands 602.
Other	67	133	United Kingdom 92; United States 20.

[1] Total imports, include reexports shown in table 3.

Source: Sierra Leone Trade Report, Government Printing Department.

COMMODITY REVIEW

METALS

Bauxite.—Sierra Leone Ore and Metal Co. (SLOM), a subsidiary of Swiss Aluminum, Ltd., producing at a rate of 10,000 tons per month, plans to double production by the end of 1965. SLOM announced plans to open a small aluminum fabrication plant in the near future.

Iron Ore.—In May 1964, Sierra Leone Development Co. Ltd. (DELCO), opened its new ore-loading plant at Pepel built at a cost of $7 million. This was a part of the $24 million program to modernize the ship channel and railroad and also to acquire new milling equipment to handle the harder ores. When completed in 1965, this program will increase DELCO production capacity by 40 percent to 2.8 million tons of ore per year (64 percent iron).

Rutile.—Sherbro Minerals, Ltd., owned 80 percent by Pittsburgh Plate Glass Co., and 20 percent by British Titan Products Co., Ltd., announced plans to mine and concentrate rutile in the Bonthe District, Southwest Province, starting in late 1966. Anticipated production of 100,000 tons per year represents a sizeable increase over the current world production of about 200,000 tons per year. A proven reserve of 3 million tons of rutile and indicated reserve of more than 30 million tons were reported. At this stage, an investment of $15 million was announced, exclusive of the $25 million already spent since 1956.

NONMETALS

Cement.—A new factory to produce cement from imported clinker was constructed in 1964.

Diamonds.—Gem diamond usually represents some 40 to 50 percent of total diamond production in Sierra Leone. During 1964 an increase in the proportion of gem diamond production was indicated by the export value on a per carat basis. The two main sources of diamonds were Sierra Leone Selection Trust, Ltd. (SLST), a subsidiary of Consolidated African Selection Trust (CAST) and the Government Diamond Office (GDO) which purchases diamonds from small operators (diggers).

The Government extended its agreement with the diamond companies so that SLST will continue to sell to Diamond Corporation (De Beer) and three U.S. companies until the end of 1965. GDO will continue to sell exclusively to the Diamond Corporation until August 1966. SLST continued to prospect the kimberlite deposits. Considerable capital expenditures and high production costs per carat were expected for these deposits.

Leon Templesman and Sons, a U.S. firm, signed an agreement with the Government to establish a factory in Sierra Leone to cut and polish rough diamonds starting by the end of 1965.

MINERAL FUELS

Petroleum.—In 1962–63 Tennessee (Sierra Leone), Inc., a subsidiary of Tennessee Gas Transmission Co., carried out a marine seismic survey covering the offshore and coastal areas of Sierra Leone between Kent and Sulima. Results were discouraging and further exploration was abandoned.

Haifa Refineries, Ltd., an Israeli Government concern, signed an agreement with the Government to build an 8,000- to 10,000-barrel-per-day oil refinery in Freetown.

SOURCE MATERIAL

Major sources of information include dispatches from the U.S. Embassy in Freetown, especially A–245, April 15, 1965; trade report of Sierra Leone; company annual reports and articles from trade journals.

The Mineral Industry of the Republic of South Africa

By Thomas C. Denton[1]

⁂

MINERAL industry participated in the economic boom that began in South Africa toward the end of 1961 and continued through 1964, one of the most prosperous years in the country's history. The South African Reserve Bank provisionally estimated the gross national product (GNP) of the Republic at current prices at \$10,384 million,[2] about 11 percent higher than in 1963. After taking into account price increases and terms of trade, the real GNP was estimated to have risen about 7.5 percent. This was the third successive year in which the South African economy achieved a real growth rate of about that magnitude.[3]

For the year ending June 30, 1964, the South African Bureau of Statistics reported net domestic product at \$8,534 million to which gold mining and other mining, the vital parts of the South African economy, contributed 9.5 percent and 3.0 percent, respectively, about the same as in 1963.[4]

Despite record gold production, the balance of payments on current account showed a net deficit of about \$98 million in 1964, principally because of increased imports and costs of services. The deficit was the first since 1958.[5]

Important improvement occurred in the contribution of the Republic to world mineral supplies in 1964. Gold production was nearly 72 percent of total non-Communist gold production compared with 70.4 percent in 1963. The estimated contribution to world platinum group metals supply increased from 19.8 percent in 1963 to 29.6 percent. For non-Communist world output, South Africa's estimated share was 57.7 percent in 1964 compared with 41.0 percent in 1963. For eight other mineral commodities the share of the Republic in 1964 world production ranged from 20.8 percent to 6.1 percent, and the Republic's contribution to non-Communist world output for these same commodities ranged from 35.7 percent to 10 percent, as shown below:

---

[1] Africa specialist, Division of International Activities.

[2] Where necessary, values have been converted from rands (R) at the rate of R1=US\$1.40.

[3] South African Reserve Bank (Pretoria). Quarterly Bulletin of Statistics. No. 75, March 1965, p. VI.

[4] Page 3 of work cited in footnote 3.

[5] U.S. Embassy, Pretoria, Republic of South Africa. Airgram A-355, Feb. 11, 1965.

Commodity	South Africa's share of output (percent)	
	Total world	Non-Communist world
Antimony	20.8	35.7
Chromium ore	19.8	33.6
Vermiculite	NA	32.7
Manganese ore	8.7	19.1
Vanadium	NA	16.7
Uranium	NA	17.4
Diamond	12.3	13.4
Asbestos	6.1	10.0

NA Not available.

The shortage of skilled labor, which has existed in recent years, persisted in 1964 despite recruitment overseas. Unskilled labor again was in sufficient supply, according to reports from South Africa. Wages of all employees were substantially increased during the year. Statistics for mine labor and other salient statistics for the mining industry are given in the paragraph that follows for 1962 and 1963, the most recent years for which data are available from the Republic of South Africa.[6]

	1962	1963
Average number of persons at work:		
Whites	87,410	87,518
Nonwhites	594,522	580,438
Total	681,932	667,956
Sources of nonwhite labor:		
Republic of South Africa ... percent of total	39	40
British Protectorates[1] ... do	20	20
Other ... do	41	40
Salaries, wages, and allowances:		
Salaries and wages, including allowances, earned, white employees ... million dollars	$290.4	$304.7
Wages earned, nonwhite employees ... do	134.1	137.3
Total ... do	424.5	442.0
Value of stores and electric power consumed ... do	481.3	493.6

[1] Bechuanaland, Basutoland, and Swaziland.

GOVERNMENT POLICIES AND PROGRAMS

Toward the end of 1964, government policy recognized danger in the rapid rate at which the economy was expanding and began to emphasize stability. The system of development plans was adopted for the first time and the Economic Development Program (EDP) for 1964–69 proposed an annual growth rate of 5.5 percent in real terms, taking 1963 as the base year.[7] That year gross domestic product (GDP) was $9,733.2 million and 7.5 percent larger than in 1962, according to the program.[8]

---

[6] Republic of South Africa, Department of Mines. Annual Report for the Year ended 31st Dec., 1963. Sec. 2, p. 24.

[7] Barclay's Bank (London). Overseas Review. February 1965, p. 1.

[8] Republic of South Africa, Department of Planning (Pretoria). Economic Development Programme for the Republic of South Africa, 1964–69.

The EDP includes assumptions, estimates, implications, and forecasts with respect to nine major sectors of mineral and mineral-based industry. For gold mining the plan estimates production to increase by only 15.7 percent over the entire period, or by 2.6 percent annually, reaching $1,114.4 million in 1969. Employment in gold mining (including uranium) declines significantly and productivity (contribution to GDP) per worker increases to $2,058 in 1969 from $1,722 in the base year. By 1969, uranium (U_3O_8) production would decline to $35 million from $99.4 million in 1963.

TABLE 1.—Salient features of mineral and mineral based sectors of the first Economic Development Program for South Africa, 1964–69 [1]

	Gold mining, including uranium		Coal mining		Other mining and quarrying [2]		Basic iron products		Basic nonferrous metals	
	1963	1969	1963	1969	1963	1969	1963	1969	1963	1969
Production million dollars	------	------	94.8	128.9	358.4	495.0	322.4	468.3	87.9	129.8
Gold do	963.2	1,114.4	------	------	------	------	------	------	------	------
Uranium do	99.4	35.0	------	------	------	------	------	------	------	------
Total do	1,062.6	1,149.4	------	------	------	------	------	------	------	------
Imports million dollars	------	------	.1	.1	54.2	161.0	36.1	50.2	50.7	70.8
Total supply-total demand do	1,062.6	1,149.4	94.9	129.0	412.6	656.0	358.5	518.5	138.6	200.6
Domestic demand million dollars	5.6	1.4	87.1	120.1	187.2	338.2	308.5	454.7	136.6	196.7
Exports do	1,057.0	1,148.0	7.8	8.9	225.4	317.8	50.0	63.8	2.0	3.9
Employment										
Whites thousand	48.7	44.0	7.0	8.6	11.0	14.0	17.6	19.0	2.9	3.5
Nonwhites thousand	395.9	357.7	65.8	77.4	87.7	113.7	20.8	22.7	5.5	6.7
Total do	444.6	401.7	72.8	86.0	98.7	127.7	38.4	41.7	8.4	10.2
Contribution to gross domestic product per worker thousand dollars	1.72	2.06	0.98	1.12	3.01	3.22	5.81	6.03	2.33	2.81

	Petroleum and coal products		Basic industrial chemicals [3]		Metal products sector		Nonmetallic mineral products	
	1963	1969	1963	1969	1963	1969	1963	1969
Production million dollars	143.5	338.2	226.4	331.2	500.5	711.7	227.9	315.0
Imports do	85.9	20.4	119.9	136.4	71.1	87.4	23.1	31.2
Total supply-total demand do	229.4	358.6	346.3	467.6	571.6	799.1	251.0	346.2
Domestic demand do	219.8	343.5	317.4	431.9	563.5	786.5	244.8	339.1
Exports do	9.6	15.1	28.9	35.7	8.1	12.6	6.2	7.1
Employment								
Whites thousand	3.7	3.9	6.5	7.0	23.0	25.7	10.7	11.5
Nonwhites do	4.7	5.1	15.5	16.7	61.5	69.0	56.6	62.3
Total do	8.4	9.0	22.0	23.7	84.5	94.7	67.3	73.8
Contribution to gross domestic product per worker thousand dollars	4.67	9.04	3.23	4.60	2.33	2.96	1.41	1.97

[1] Base year is 1963. Assumed annual overall growth rate of the economy for the period is 5½ percent.

[2] Imports under this heading include crude petroleum.

[3] Includes fertilizers, explosives, acids, etc.

Source: Republic of South Africa, Department of Planning (Pretoria). Economic Development Programme for the Republic of South Africa, 1964–69.

The government began a program under which certain marginal gold mines qualified for financial assistance to continue production and/or to explore potentially profitable ground. For the year ending June 30, 1964, the government allotted an amount not to exceed $1.4 million to help meet the cost of pumping water entering marginal mines from abandoned mines. At the end of 1963, 23 mines could be regarded as marginal according to the annual report for 1963 of the Government Mining Engineer.[9] In 1964, several such gold mines closed down, or declared intention to do so.

PRODUCTION

The preliminary index of the volume of mining production including gold stood at 156.9 for 1964, 6.4 percent higher than in 1963 (1957 equals 100). With minor exceptions, index figures increased generally. In the metals area, iron ore output registered the largest gain, from 240.7 in 1963 to 288.2 in 1964. The index for manganese rose 11 percent. Gold production increased to 170.9 from 161.0 in 1963.[10]

Reflecting the rise in volume and generally firmer prices, the value of production also improved. Total value for 1964 was $1.5 billion, more than 7 percent higher than in 1963, as measured by the value of gold and silver produced, diamond sales and sales and exports of other metals and minerals. The overall increase was realized despite a decrease of $12.2 million in the value of uranium exports. Minerals besides platinum, copper, and manganese ore which made important gains by value included antimony (57 percent), vanadium (81 percent), andalusite (28 percent), and sillimanite (20 percent).

TABLE 2.—Approximate value of mineral production

(Million U.S. dollars)

Commodity	1960	1961	1962	1963	1964
Gold (production)	750.4	804.9	891.2	960.8	1,022.7
Silver (production)	2.1	2.2	2.7	3.5	3.8
Diamond (sales of domestic production)	47.4	53.7	51.1	51.3	61.9
Quarry products (local sales)	4.1	5.4	4.0	6.0	7.5
Other minerals: [1] [2]					
Local sales [2]	132.3	142.4	146.1	162.7	180.7
Exports:					
Fissionable materials [3]	137.9	111.0	103.2	93.5	81.4
Other	125.3	132.6	132.9	139.1	160.7
Total	1,199.5	1,252.2	1,331.2	1,416.9	1,518.7

[1] Reported in source as "industrial minerals"; includes all mine products except those named above.

[2] Includes an item identified in source only as "other", valued as follows in U.S. dollars: 1960—$22.2 million; 1961—$24.3 million; 1962—$21.5 million; 1963—$28.6 million; 1964—$32.2 million. The item includes materials quarried and used by municipalities, etc., and valued for statistical purposes but not sold.

[3] Comprises uraniun (U_3O_8) and, before 1962, relatively small quantities of monazite.

Source: Republic of South Africa, Department of Mines. Minerals Quarterly Information Circular, October to December issues for 1960 through 1964.

---

[9] Page 5 of work cited in footnote 6.

[10] Commerce and Industry. Monthly Journal of the Department of Commerce and Industries of South Africa. April 1965, p. 423.

TABLE 3.—Republic of South Africa: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Antimony, content of cobbed ore and concentrate	12,281	10,708	10,611	[r] 11,258	12,882
Beryl, approximately 11.7 percent BeO	295	174	327	386	137
Bismuth, content of concentrate kilograms	232	76	59	[r] 1,147	77
Chromite:					
44 percent or less Cr_2O_3	238,116	243,076	257,868	132,773	180,971
More than 44 percent to 48 percent Cr_2O_3	521,585	649,988	632,348	639,692	641,823
More than 48 percent Cr_2O_3	12,238	4,795	22,564	19,695	26,752
Total	771,939	897,859	912,780	792,160	849,546
Copper:					
Concentrate, metal content	----------	2,054	190	642	4,979
Blister	35,117	35,517	35,415	39,470	42,461
Fire refined	10,017	16,702	10,765	15,038	12,052
Electrolytic [e]	1,800	1,800	1,800	1,800	2,200
Gold thousand troy ounces	21,383	22,941	25,492	27,432	29,112
Iron and steel:					
Iron ore, 60 percent or more Fe thousand tons	3,071	3,961	4,331	4,460	4,830
Pig iron do	1,826	2,169	2,220	2,217	[p] 2,656
Ferroalloys do	173	159	196	224	NA
Steel:					
Ingots and castings do	2,112	2,484	2,633	2,834	[p] 3,003
Semimanufactures do	1,338	1,444	1,722	[p] 1,910	NA
Lead, content of concentrate	123	93	5	15	----------
Magnetite	268	213,077	280,984	529,623	859,013
Manganese ore:					
Metallurgical:					
Over 30 to 40 percent Mn thousand tons	NA	NA	NA	494	406
Over 40 to 45 percent Mn do	NA	NA	NA	469	478
Over 45 to 48 percent Mn do	NA	NA	NA	231	334
Over 48 percent Mn do	NA	NA	NA	52	61
Subtotal do	NA	NA	NA	1,246	1,279
Chemical:					
Over 35 to 65 percent MnO_2 do	NA	NA	NA	52	34
Over 65 to 75 percent MnO_2 do	NA	NA	NA	7	3
Over 75 to 85 percent MnO_2 do	NA	NA	NA	3	5
Subtotal do	NA	NA	NA	62	42
Manganiferous iron ore, 15 to 30 percent Mn and 20 to 35 percent Fe thousand tons	NA	NA	NA	50	148
Total do	[1] 1,194	[1] 1,418	[1] 1,465	[r] 1,358	1,468
Monazite	----------	----------	4,832	2,087	----------
Nickel, electrolytic [e]	2,900	2,600	2,400	2,400	2,400
Platinum group metals:					
Osmiridium [2] thousand troy ounces	6	7	6	5	6
Platinum and other, contained in concentrates, matte, and refinery products [e] thousand troy ounces	400	350	300	300	600
Silver do	2,227	2,288	2,549	2,737	2,917
Tantalum concentrates	6	9	4	29	6
Tin:					
Concentrates, metal content long tons	[r] 1,276	1,430	1,408	[r] 1,530	1,586
Metal, smelter production do	622	870	821	[r] 938	1,016
Titanium concentrates:					
Ilmenite	82,038	89,820	79,012	28,158	----------
Rutile	3,352	3,160	3,243	1,256	----------
Tungsten ore and concentrate 60 percent WO_3	34	27	23	8	4
Uranium U_3O_8	5,840	4,961	4,558	4,116	4,032
Vanadium, fused oxide, 99.9 percent V_2O_5	1,066	2,311	2,260	2,255	NA
Zircon, concentrates and flour	6,682	6,901	6,877	2,402	----------
Nonmetals:					
Andalusite	9,301	7,045	18,338	10,008	13,972
Asbestos:					
Amosite	62,260	62,808	67,933	70,414	70,103
Chrysotile	26,735	28,781	27,209	26,243	32,587
Crocidolite	70,535	85,094	105,532	89,965	92,891
Tremolite	13	67	87	25	----------
Total	159,543	176,750	200,761	186,647	195,581
Barite	1,704	1,780	1,699	2,453	2,572

See footnotes at end of table.

TABLE 3—Republic of South Africa: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Nonmetals—Continued					
Cement ... thousand tons	2,705	2,598	2,659	2,884	3,456
Clays:					
Bentonite [3]	3,475	4,107	5,745	7,814	9,314
Fire clay [3]	198,101	243,841	183,042	223,561	256,648
Fuller's earth [3]	519	671	668	452	835
Kaolin [3]	26,639	24,495	26,920	34,355	39,996
Flint clay	[3] 59,564	217,513	155,782	136,208	192,872
Corundum	112	144	317	72	54
Diamond:					
Pipe mines ... thousand carats	2,591	3,258	3,290	3,744	9,555
Alluvial mines ... do	549	530	628	631	3,994
Total ... do	3,140	3,788	3,918	4,375	13,549
Diatomite	314	124	587	200	495
Emerald crystals ... kilograms	1,621	860	212	[r] 239	208
Feldspar	15,850	23,664	28,662	42,036	36,095
Fluorspar:					
Acid grade	NA	1,706	4,132	7,539	6,066
Ceramic grade	NA	9,862	31,439	16,632	2,129
Metallurgical grade	NA	75,396	65,746	28,229	52,070
Total	103,010	86,964	101,317	52,400	60,265
Graphite	811	874	1,187	609	945
Gypsum	195,783	173,361	192,001	187,464	240,082
Limestone [3] ... thousand tons	5,295	5,244	5,300	5,802	6,971
Lithium minerals	157	236	1,146	378	162
Magnesite	60,593	61,444	92,852	98,256	84,770
Mica	3,045	2,469	2,224	2,123	3,115
Mineral pigments	5,784	5,104	4,559	3,966	4,975
Phosphates, crude	267,649	296,586	307,161	454,911	578,893
Pyrites [4]	500,068	446,805	440,993	418,551	432,475
Salt ... thousand tons	253	208	255	198	300
Shale	190,882	176,394	163,200	176,180	233,611
Silcrete [5]	----------	8,463	11,500	14,878	19,695
Silica and silica sand	183,726	194,678	199,491	275,107	324,304
Sillimanite	53,418	85,760	53,662	56,241	54,649
Sulfur, elemental, refinery byproduct	NA	2,198	1,944	2,013	5,792
Talc	1,795	2,975	12,629	6,864	6,617
Tiger's eye [6]	3	15	93	117	73
Vermiculite	62,615	64,517	77,595	89,591	101,488
Wonderstone (pyrophyllite)	634	928	1,676	1,855	1,704
Mineral fuels:					
Coal, marketable:					
Anthracite ... thousand tons	643	1,297	1,110	1,152	NA
Bituminous ... do	37,530	38,268	40,165	41,302	NA
Total ... do	38,173	39,565	41,275	42,454	44,917
Coke ... do	2,206	2,297	2,313	2,412	NA
Petroleum refinery products: [7]					
Gasoline [8] ... thousand 42-gallon barrels	4,327	4,790	5,235	5,107	NA
Aviation turbine fuel ... do	175	230	251	1,449	NA
Kerosine ... do	1,159	1,023	1,116		
Distillate fuel oil [9] ... do	2,413	2,843	3,069	3,918	NA
Residual fuel oil ... do	1,590	2,057	2,237	4,662	NA
Liquefied petroleum gas ... do	107	NA	NA	NA	NA
Asphalt and bitumen ... do	750	NA	NA	NA	NA
Other ... do	268	NA	NA	NA	NA
Carbon black	NA	1,870	7,638	9,708	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Not reported on same basis as in 1963–64. Previous distribution in thousand tons was as follows: 40 percent or less Mn, 1960—698, 1961—713, 1962—638; more than 40 to 45 percent Mn, 1960—290, 1961—378, 1962—519; more than 45 to 48 percent Mn, 1960—154, 1961—220, 1962—225; over 48 percent Mn, 1960—52, 1961—107, 1963—83.

[2] Natural alloy of osmium, iridium, small quantities of other platinum group metals, and gold; recovered by certain gold mines.

[3] Local sales (total output not reported).

[4] Includes small quantities of cupreous pyrite.

[5] Dense rock containing up to 98.4 percent SiO_2; used in manufacture of silica refractories.

[6] Decorative material resulting from oxidation and silicification of crocidolite.

[7] Includes production from imported oil, domestic oil shale, and domestic coal.

[8] Includes Union Motor Spirit; a blend of 50 percent imported gasoline and 50 percent sugarcane alcohol.

[9] May include some residual fuel oil.

TRADE

In the official Foreign Trade Statistics of the Republic of South Africa, the statistical territory of the Republic include the Territory of South-West Africa and the British High Commission Territories of Basutoland, Bechuanaland and Swaziland. Hence items of external trade involving only the Republic are not always identifiable. However, for this chapter a supplementary source that lists South African exports separately has been used to provide most of the export data; thus the problem of inseparability is confined mainly to imports. South Africa accounts for nearly all the external trade of the whole statistical territory.

Preliminary statistics for all of 1964 indicated that the adverse balance in total visible trade excluding gold increased to $814.1 million from $401.9 million in 1963. Including gold, however, there was a favorable balance of more than $140.0 million compared with a favorable balance of about $644 million in 1963.[11]

In 1963, South Africa's balance of trade in nonfuel minerals, metals and semimanufactures of mineral origin was somewhat less favorable than in 1962. Exports of iron and steel declined whereas there was an increase in such imports and in metal imports generally. Uranium exports declined by nearly $10 million but the value of diamond exports rose by more than twice that amount. Net export values in 1962 and 1963 by category were approximately as follows:

	Value, million dollars	
	1962	1963
Iron and steel	34.4	31.5
Uranium	103.3	93.5
Other nonferrous metals	23.1	14.1
Nonmetals	174.7	190.9
Total	335.5	330.0

Net imports of mineral fuels were $69.9 million in 1963 compared with $75.5 million[12] in 1962. Reexports and exports of petroleum refinery products, chiefly as ships' bunkers, increased by $2.4 million, reaching $24 million in 1963. The contribution of coal to exports was $10.5 million, about $1 million less than in 1962.

Excluding gold, the value of exports in 1963 of minerals, metals, and semimanufactures of mineral origin was about $524 million and about 41 percent of the value of all 1963 exports excluding gold. Including $961 million of gold production, the contribution of mineral industry to total export earnings was 66 percent compared with 65 percent in 1962.

The breakdown of 1962 and 1963 mineral exports by major commodity categories was approximately as follows, in millions of dollars:

---

[11] Barclay's Bank (London). Overseas Review. February 1965, p. 17.

[12] Revised figure.

	1962	1963
Metals:		
Iron and steel	64.6	61.7
Uranium (U_3O_8)	103.3	93.5
Other	79.7	87.7
Total	247.6	242.9
Nonmetals:		
Diamonds	184.0	205.9
Other	40.1	41.1
Total	224.1	247.0
Mineral fuels:		
Coal and coke	11.5	10.5
Petroleum refinery products [1]	21.6	24.0
Total	33.1	34.5
Grand total	504.8	524.4

[1] Includes reexports.

TABLE 4.—Republic of South Africa: Exports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Antimony concentrate	18,349	19,474	United Kingdom [2] 11,420; United States 6,303; Japan [2] 966.
Beryllium ore	318	270	All to United States.
Bismuth concentrate	1		
Chromite	754,539	587,444	United States 410,579; West Germany 53,758; United Kingdom 42,544; Japan 34,558.
Copper:			
Contained in concentrate	43	592	All to Japan.
Blister and fire refined	43,476	52,399	United States 16,302; Italy 12,467; Belgium 10,972.
Gold:			
Contained in ore and concentrate. troy ounces	1,393	NA	
Bullion do	19,390,000	NA	
Iron and steel:			
Iron ore	754,312	604,078	Japan 563,237; Italy 22,413; West Germany 14,900.
Pig iron [2]	216,006	218,821	United States 69,041; Japan 49,986; Netherlands 45,310; Italy 34,424.
Ferroalloys:			
Ferromanganese [2]	78,687	106,544	United Kingdom 37,127; United States 21,742; Australia 10,582.
Other [2]	15,374	38,936	Australia 9,441; United Kingdom 7,636; United States 6,404; West Germany 5,876.
Steel ingots and equivalent forms [2]	30,958	2,935	Mozambique 2,362.
Semimanufactures:			
Angles, shapes, and sections [2]	8,282	6,147	Federation of Rhodesia and Nyasaland 4,384; Mozambique 1,269.
Bars and rods [2]	62,438	73,880	United States 52,909; United Kingdom 9,347; Federation of Rhodesia and Nyasaland 6,487.
Drill and tool steel [2]	82	130	Federation of Rhodesia and Nyasaland 120.
Plate, sheet, and strip:			
Plain [2]	55,061	28,715	United States 10,001; Federation of Rhodesia and Nyasaland 9,060; United Kingdom 7,642.
Galvanized [2]	28,512	13,694	Federation of Rhodesia and Nyasaland 10,344; United States 1,578.
Undifferentiated [2]	105,372	102,866	United Kingdom 35,699; United States 33,874; Italy 15,481.
Pipe [2]	10,453	18,468	Federation of Rhodesia and Nyasaland 8,911; Mozambique 8,113.
Pipefittings [2]	2,221	2,166	Federation of Rhodesia and Nyasaland 1,418.
Rails [2]	22,768	21,117	Federation of Rhodesia and Nyasaland 15,232; Mozambique 5,882.
Total [2]	295,189	267,183	
Magnetite	512		

See footnotes at end of table.

TABLE 4.—Republic of South Africa: Exports of metals and minerals[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals—Continued			
Manganese:			
Ore:			
Metallurgical grade	NA	852, 540	France 178,347; West Germany 177,712; Belgium 113,524; United States 110,897.
Chemical grade	NA	8, 532	United Kingdom 6,382; Japan 1,207; France 736.
Manganiferous iron ore	NA	41, 374	West Germany 35,764; Netherlands 5,610.
Total	862, 730	902, 446	
Electrolytic metal [2]	3, 661	4, 532	United Kingdon 895; United States 812; France 661; Sweden 653.
Monazite	8, 114	3, 102	NA.
Platinum-group metals. troy ounces	300, 000	NA	NA.
Silver thousand troy ounces	2, 121	NA	NA.
Tantalite	10	21	United States 13; United Kingdom 8.
Tin concentrate long tons	[r] 1, 422	1, 155	All to United Kingdom.
Titanium:			
Ilmenite	60, 308	14, 691	NA.
Rutile	294	----------	
Tungsten concentrate	----------	5	All to United Kingdom.
Uranium, U_3O_8 [3]	4, 183	3, 756	NA.
Vanadium:			
Fused oxide	1, 440	1, 731	NA.
Ammonium vanadate	47	24	NA.
Zirconium concentrates	6, 045	2, 544	NA.
Scrap and old metal, not further identified.[2]	5, 880	941	Japan 292; West Germany 132; United States 109.
Nonmetals:			
Andalusite and sillimanite	46, 256	43, 296	Japan 19,141; United Kingdom 12,761; West Germany 9,363.
Asbestos:			
Amosite	63, 193	66, 133	United States 20,523; United Kingdom 18,575; Australia 6,149; Italy 5,414; Japan 4,486.
Crysotile	24, 982	14, 614	West Germany 3,075; Spain 2,780; Italy 1,647; Thailand 1,181; Japan 1,178.
Cape blue	68, 135	77, 596	United States 11,753; Italy 9,318; Japan 8,250; West Germany 6,591; United Kingdom 5,332; Belgium 5,019; France 5, 000.
Transvaal blue	10, 765	8, 445	United Kingdom 1,836; Japan 1,329; Italy 1,299; United States 975.
Tremolite	----------	8	All to Federation of Rhodesia.
Total	167, 075	166, 796	
Cement:			
Building	16, 018	29, 122	Mauritius 22,717; Federation of Rhodesia and Nyasaland 865.
Fire and furnace [2]	3, 908	4, 961	Federation of Rhodesia and Nyasaland 3,480.
Other [2]	691	849	Federation of Rhodesia and Nyasaland 647.
Corundum, crystal	317	72	NA.
Diamond:			
South African origin:			
Rough, uncut. thousand carats	1, 744	2, 043	United Kingdom 1,740; Netherlands 125; Belgium 93; United States 57.
Unmounted, cut and polished. do	133	124	Belgium 56; United States 24; Hong Kong 20; Switzerland 11.
Manufactured do	998	1, 475	Ireland 1,419; United States 39.
Mixed origin, rough, uncut.[4] do	16, 645	15, 732	United Kingdom 10,704; United States 3,383; Ireland 1,356.
Total do	19, 520	19, 374	
Emerald crystals kilograms	162	239	United Kingdom 218; Switzerland 21.
Feldspar	7, 805	10, 463	West Germany 4,471; United Kingdom 3,478.
Flint clay	73, 662	100, 023	West Germany 62,857; Japan 26,063; United Kingdom 6,835.
Fluorspar:			
Acid grade	2, 123	4, 668	Japan 3,920; Australia 531.
Ceramic grade	26, 349	7, 853	Japan 7,071; Australia 281; Uganda 279.
Metallurgical grade	42, 458	44, 955	Japan 22,807; Canada 8,709; Sweden 3,144.
Total	70, 930	57. 476	

See footnotes at end of table.

TABLE 4.—Republic of South Africa: Exports of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Nonmetals—Continued			
Granite	17,103	44,472	West Germany 25,103; France 11,044.
Graphite	18		
Gypsum	14,524	13,512	Federation of Rhodesia and Nyasaland 12,254.
Lime and limestone	11,386	26,557	Federation of Rhodesia and Nyasaland 24,367.
Lithium minerals	931	386	United Kingdom 338; Netherlands 48.
Magnesite	10		
Marble	7		
Mica	795	1,455	NA.
Mineral pigments	2,519	2,188	United Kingdom 1,869; Australia 117; United States 116.
Phosphates, crude	76		
Pyrite, sulfur content	4,488	1,949	All to South-West Africa.
Salt	25,122	25,714	Federation of Rhodesia and Nyasaland 21,810; Swaziland 3,569.
Silcrete	122		
Talc	1	13	Federation of Rhodesia and Nyasaland 8; Angola 5.
Tiger's eye	57	136	United States 83; Japan 24; South-West Africa 18.
Vermiculite	69,759	82,360	United Kingdom 25,680; Italy 14,262; United States 13,006; West Germany 6,894; France 6,725.
Wonderstone	1,036	1,395	United States 1,382.
Mineral fuels:			
Coal:			
Anthracite [2] thousand tons	525	675	Italy 208; France 172; Japan 106; Belgium 45; Netherlands 39; Federation of Rhodesia and Nyasaland 14.
Other [2] do	1,121	723	Mozambique 400; Ceylon 136; Italy 50.
Total [2] do	1,646	1,398	
Coke [2]	13,811	3,442	NA.
Petroleum refinery products: [5]			
Gasoline [2] thous. 42-gal. bbls	r 164	81	Rep. of South Africa bunker loadings 51; Federation of Rhodesia and Nyasaland 18; Mozambique 9.
Kerosine [2] do	r 123	222	Rep. of South Africa bunker loadings 139; Mozambique 71.
Distillate fuel oil [2] do	r 352	592	Rep. of South Africa bunker loadings 404; Madeira 184.
Residual fuel oil [2] do	r 2,880	3,598	Rep. of South Africa bunker loadings 3,350; United Kingdom 201.
Lubricating oil [2] do	237	216	Federation of Rhodesia and Nyasaland 114; Mozambique 52; Rep. of South Africa bunker loadings 28.
Other liquid products [2] do	62	93	West Germany 61; United Kingdom 19; Federation of Rhodesia and Nyasaland 7.
Asphalt and bitumen [2]	r 44,022	27,066	Mozambique 9,267; Federation of Rhodesia and Nyasaland 9,191.

---

r Revised. NA Not available.

[1] Except as noted, exports are those of the Republic of South Africa only and do not include material shipped from the High Commission Territories of Basutoland, Bechuanaland Protectorate, and Swaziland or from the Territory of South-West Africa.

[2] Nature of source precludes eliminating exports originating in the High Commission Territories and in South-West Africa.

[3] Reported as "Prescribed material under the Atomic Energy Act."

[4] Includes an undisclosed quantity of South African production together with diamonds produced elsewhere in Africa and shipped to the Republic of South Africa for sorting and subsequent reexport. About 80 percent of the quantity reported is crushing bort from the Republic of the Congo (Léopoldville).

[5] All data revised from that published in the Republic of South Africa chapter in volume IV of the 1963 Minerals Yearbook; data given there include bonded reexports not listed among imports.

Crude petroleum and petroleum refinery products accounted for about 44 percent of the value of metal, mineral and mineral fuel imports in 1963, somewhat less than in 1962. Crude imports increased by 31 percent to $25.5 million, whereas imports of refinery products declined by $10.3 million to $78.7 million. Iron and steel imports rose by about $6 million to $30.2 million. Fertilizer imports were valued at $13.5 million compared with $10.3 million in 1962.

TABLE 5.—Republic of South Africa: Imports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963 [2]
Metals: [3]			
Aluminum:			
Ingots and equivalent forms	14,023	16,752	Canada 15,361; United States 479;France 363.
Semimanufactures	2,718	4,641	United Kingdom 2,173; United States 748; West Germany 469.
Antimony, primary forms	267	321	NA.
Copper and its alloys:			
Ingots and equivalent forms:			
Unalloyed	24,965	26,025	Federation of Rhodesia and Nyasaland 22,301.
Alloyed	39	67	United Kingdom 44; Sweden 12.
Semimanufactures:			
Unalloyed	[r]251	430	United Kingdom 202; West Germany 96.
Alloyed	815	939	United Kingdom 565; Italy 200; West Germany 85.
Iron and steel:			
Pig iron	150	365	United Kingdom 272; Federation of Rhodesia and Nyasaland 86.
Ferroalloys:			
Ferromanganese	11	4	NA.
Ferrosilicon	460	856	West Germany 826.
Other	412	140	Federation of Rhodesia and Nyasaland 95; Sweden 17.
Semimanufactures:			
Bars, rods, profiles, and sections.	6,187	7,529	United Kingdom 4,148; Belgium 2,743.
Plates, sheets, hoops, and strips uncoated.	8,719	35,120	Japan 13,838; United Kingdom 8,572; Netherlands 6,881.
Plate and sheet, tin coated	61,774	68,615	United Kingdom 59,743; Canada 4,660.
Plate and sheet, other coated.	853	724	United Kingdom 459; West Germany 113.
Cast pipe	625	825	United Kingdom 824.
Wrought pipe	7,991	5,493	United Kingdom 3,953; West Germany 543; Belgium 477.
Other pipe and tubes	2,044	1,391	Sweden 750; United Kingdom 299; West Germany 105.
Rails, sleepers and rail accessories.	2,068	4,025	United Kingdom 3,628.
Tool and drill steel	1,488	1,986	United Kingdom 1,222; Sweden 521.
Rough castings	154	390	West Germany 281; United Kingdom 101.
Total	91,903	126,098	
Lead:			
Ingots and equivalent forms	13,646	15,485	Federation of Rhodesia and Nyasaland 8,619; Australia 2,471; Mexico 1,676.
Semimanufactures	76	50	NA.
Mercury 76-pound flasks	952	805	Italy 377; Spain 152; United Kingdom 109.
Platinum troy ounces	2,441	1,687	United Kingdom 1,681.
Tin:			
Ingots and equivalent forms. long tons	504	794	Federation of Rhodesia and Nyasaland 520.
Semimanufactures do	1	396	United Kingdom 359.
Zinc:			
Ingots and equivalent forms	27,095	34,309	Federation of Rhodesia and Nyasaland 29,219.
Fume dust and shavings	59	16	NA.
Semimanufactures	200	140	United Kingdom 63; United States 47.
Metals not further specified:			
Precious metal, not further identified. troy ounces	3,533	16,009	NA.
Solder and brazing alloys	125	136	United Kingdom 105.
Composition metal	107	68	United Kingdom 40.
Scrap and old metal	18,268	27,820	Federation of Rhodesia and Nyasaland 19,938; United Kingdom 1,550; Mozambique 1,372.
Miscellaneous crude metals and ores.	39,578	179,633	Federation of Rhodesia and Nyasaland 171,184; Mozambique 5,272.
Pipe fittings of ferrous and nonferrous metals.	1,582	2,036	United Kingdom 1,097; West Germany 703.
Other, unspecified	514	1,200	Federation of Rhodesia and Nyasaland 700; United Kingdom 282.

See footnotes at end of table.

TABLE 5.—Republic of South Africa: Imports of metals and minerals [1]—Con.

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963 [2]
Nonmetals:			
Abrasives:			
Emery	89	166	France 62; United States 28.
Pumice	110	132	NA.
Barite	2,115	2,065	Federation of Rhodesia and Nyasaland 1,085; West Germany 700.
Borax	1,706	1,367	United States 1,355.
Cement	9,422	12,837	United Kingdom 7,666; Mozambique 2,552.
Clays:			
Cornish stone, kaolin and china clay.	4,469	5,142	United Kingdom 2,508; United States 1,213; West Germany 857.
Fire clay	1,730	2,936	United States 679; United Kingdom 633.
Diamond, rough:			
Of mixed African origin. thousand carats	1,035	2,122	United Kingdom 2,107; Netherlands 9; Belgium 4.
Other do	15,012	14,920	NA.
Diatomaceous earth	2,425	2,661	United States 1,384; France 309; West Germany 276.
Fertilizer and fertilizer raw materials:			
Nitrogenous:			
Ammonium nitrate	19,674	50,145	West Germany 24,131; Portugal 14,837; Netherlands 9,271.
Ammonium sulfate	61,530	118,443	West Germany 50,489; Netherlands 24,841; Japan 24,604.
Phosphatic:			
Phosphate rock	451,897	818,962	NA.
Thomas slag (basic slag)	44,759	40,078	Belgium 38,318.
Superphosphate	6,495	13,625	Netherlands 6,687; Federation of Rhodesia and Nyasaland 5,047.
Potash	81,597	118,443	West Germany 38,239; United States 37,290; France 29,831.
Fuller's earth	994	1,155	United Kingdom 718; United States 437.
Graphite	567	784	United Kingdom 460; United States 150.
Gypsum, including plaster of paris	2,444	2,611	West Germany 1,967; United Kingdom 623.
Mica, all forms	29	41	United Kingdom 29.
Silica	582	1,946	Belgium 926; United States 604; West Germany 286.
Salt	2,321	2,458	United Kingdom 2,075.
Sulfur	118,338	124,110	Mexico 63,430; France 30,416; Canada 24,465.
Other earths and clays	93	103	NA.
Mineral fuels:			
Coal	r 58,911	49,509	All from Federation of Rhodesia and Nyasaland.
Coke	r 10	5	NA.
Petroleum:			
Crude oil thous. 42-gal. bbls	12,095	15,882	NA.
Refinery products:			
Gasoline do	10,424	9,225	NA.
Benzine, naphtha, white spirit, etc. do	475	451	NA.
Kerosine do	3,036	3,153	NA.
Distillate fuel oil do	4,795	4,499	NA.
Residual fuel oil do	1,567	880	NA.
Lubricating oil do	1,261	939	United States 334; Netherlands Antilles 239; United Kingdom 196.
Pavement oil do	2	(4)	NA.
Other do	37	45	NA.
Bitumen	31,577	32,751	United States 13,497.

---

r Revised. NA Not available.

[1] Includes imports for British High Commission Territories of Basutoland, Bechuanaland Protectorate, and Swaziland as well as for the Territory of South-West Africa.

[2] As a result of changes in the format of the source, detail on countries of origin for 1963 is incomplete in the case of some commodities and virtually nonexistent in others. Where it appears reasonably complete, a quantity has been entered but such quantities should be understood to represent only the minimum amount possibly creditable to the indicated country; these quantities may have been exceeded in actuality.

[3] The term "ingots and equivalent forms" includes ingots, pigs, blocks, cast bars, and cast rods; it excludes powder, all rolled products, all extruded products and most castings in special shapes. The term "Semimanufactures" includes powder, rolling mill, and extrusion press products (not further worked) as well as most castings in special shapes. Wire, however, is omitted from all classes because it is inseparable in the source from wire products.

[4] Less than ½ unit.

South African trade with the United States has increased steadily in recent years. Preliminary figures showed that in 1964 the United States supplied 19 percent ($406 million) of South Africa's total imports and that South Africa exported to the United States 8 percent ($115 million) of her total exports. Corresponding figures for 1963 were: South African imports from the United States 17 percent ($286 million); exports to the United States 8.9 percent ($124 million). The statistics exclude South African products re-exported to the United States via third countries.[13]

The 1963 exports to the United States included raw minerals, copper, pig iron, ferroalloys, and steel semimanufactures with a total value of at least $53.1 million. The raw minerals included the following:

Commodity:	Value, thousand dollars
Antimony concentrates	1,346
Beryllium ore	78
Asbestos, amosite and crocidolite	6,576
Chromium ore	4,143
Diamond	1,486
Manganese ore	1,751
Vermiculite	227
Total	15,607

With respect to imports of mineral origin from the United States, the largest item was lubricating oils valued at $4.3 million.

COMMODITY REVIEW

METALS

Antimony.—In 1964 South Africa supplied nearly 24 percent of United States imports of antimony; the sole producer was again Consolidated Murchison (TVL) Goldfields Development Company Ltd. Murchison experienced an unusually profitable year, as a result of a strong market for antimony along with increased output. Combined production of concentrates and cobbed ore averaging 60.46 percent antimony was 21,381 tons from 180,439 tons of ore handled. Operating profit increased to $3,703,000 from $1,667,000 in 1963. Dividends declared totaled $2,068,000 compared with $874,000 in 1963. It was decided to expand milling capacity to about 18,100 tons per month, about a 20-percent increase over the 1964 milling rate. The new capacity was expected to be available during the third quarter of 1965. During the year the principal Alpha shaft was sunk 985 meters to a total depth of 1,048 meters. Final planned depth is 1,103 meters. Ore reserves at yearend were reported at 405,000 tons, assuming prices for antimony and gold then prevailing. This is the largest reserve reported since 1955 or earlier.

Chromium.—Production, local sales and exports of chromite improved significantly compared to 1963. Local sales increased to 121,350 tons worth $976,823 from 82,298 tons worth $762,177. Exports increased 7.1 percent in volume and 8.8 percent in value, the latter reaching $6,633,225 in 1964. The outlook for 1965 was favorable, particularly for increased local consumption of chromite.

---

[13] U.S. Embassy, Pretoria, Republic of South Africa, Airgram A–357, Feb. 18 1965.

Encouraging results were reported in the experimental pyrometallurgical beneficiation of South African chromite. The ore as mined contains about 44 percent Cr_2O_3 and has a chromium to iron ratio ranging from 1.6:1 to 1.8:1. Treatment of such ore resulted in a product with a chromium to iron ratio of 6.4:1 and a chromium recovery of 90.9 percent.[14]

Before 1964 individual shipments of South African chromium ores rarely exceeded 10,000 tons, but in September 1964 ships were loading 20,000 tons regularly. One such shipment from Lourenco Marques, Mozambique, to United States Atlantic ports carried a freight rate of $7.40 per ton.[15]

Copper.—Combined production of blister copper and fire-refined copper was virtually unchanged from that in 1963, but output of copper-in-concentrates for export to Japan increased by nearly 700 percent, reaching 4,979 tons. Exports of blister and fire-refined copper were valued at $33.3 million, of which takings by the United States accounted for $12.3 million and by the United Kingdom, $5.7 million. Local sales of fire-refined copper in 1964 totaled 1,332 tons valued at $8.7 million.

Palabora Mining Co. Ltd., continued work on its open-pit mine, concentrator, and smelter in eastern Transvaal and is expected to begin production early in 1966. During the year the company negotiated a contract with Japanese steel companies to deliver about 8 million tons of byproduct magnetite. At yearend Palabora was investigating the economies of adding an electrolytic copper refinery to its metallurgical facilities at Phalaborwa; a decision was expected by mid–1965. Palabora will produce annually about 36,000 tons of blister copper over and above the tonnage of blister committed at yearend to overseas buyers. South Africa has been importing about 32,000 tons of electrolytic copper annually, and by 1970 annual consumption is expected to run around 41,000 tons. Present imports are mostly from Zambia and the Republic of the Congo (Léopoldville).[16]

O'okiep Copper Co. Ltd., in its financial year ending June 30, 1964, increased output of blister copper to 41,688 tons, nearly 13 percent more than in the previous year. Blister copper sold amounted to 38,026 tons. The price per pound ex-mine of blister sold was 25.54 cents, which compares with 24.64 cents in 1963.

The company mined 2,364,000 tons of ore in 1964 compared with 1,842,000 tons in the previous year. Copper content of the ore delivered to the company's three mills averaged 1.93 percent compared with 2.12 percent in 1963. In October 1964 the monthly milling rate at Carolusberg was increased by 25 percent to 91,000 tons. By the end of the year ore was being mined from East O'okiep, and at West O'okiep and Narrop ore reserves had been exhausted. Sulfide ore reserves as of June 30, 1964, were estimated at 26.6 million tons averaging 1.87

---

[14] Jochens, P. R., and Howat, D. D. The Application of the Fluo-Solids Reactor to the Pyrometallurgical Beneficiation of South African Chromite. South African Institute of Mining and Metallurgy (Johannesburg), v. 65, No. 4, November 1964, pp. 236–253.

[15] Metal Bulletin (London) No. 4927, Sept. 4, 1964, p. 19.

[16] South African Mining and Engineering Journal (Johannesburg). V. 76, pt. 1, Jan. 1, 1965, p. 5.

percent copper, compared with 25 million tons averaging 2.01 percent copper a year earlier.

The Messina (Transvaal) Development Co., Ltd., in the year ending September 30, 1964, realized a net profit of $4.9 million after providing for taxes and interests of minority shareholders, which was about $2.2 million larger than the corresponding figure for the preceding financial year. The increase resulted from larger production and higher copper prices. Ore output from the company's Messina mine in Transvaal Province totaled 915,000 tons averaging 1.25 percent copper. Ore reserves at Messina at yearend were 5.1 million tons averaging 1.48 percent copper.

The smelter produced 12,997 tons of fire-refined copper assaying 99.923 percent copper. The recovery of copper from concentrates was 96.52 percent. Slag dumped contained 0.60 percent copper.

In August the Messina Board of Directors decided to sell part of future output at prices higher than those quoted by major producers, according to the Chairman of the Board, who said also that the decision was taken as being in the best interests of Messina shareholders and that he realized the danger inherent in high prices for copper and sympathized with the efforts of major world producers to maintain reasonable and stable prices.

Ferroalloys.—At Middleburg, the world's first plant to use South African chemical grade chromite from which to manufacture ferrochromium was officially opened in October. The low carbon ferrochromium plant of R.M.B. Alloys (Pty.) Ltd. required 2 years to build. The project, supported by Rand Mines Ltd., was revolutionary in that Transvaal chromium ores had been considered too low grade for ferrochromium manufacture. With extensions in progress late in 1964, the annual capacity of the new plant will be 32,000 tons of low carbon ferrochromium.

The product is regarded as premium grade, with carbon content less than 0.03 percent. At the inaugural ceremonies the Minister of Mines of South Africa, said it was essential for South Africa to export her minerals in forms as advanced as possible. He also said "it is not impossible to think of South Africa becoming the world's main supplier of ferroalloys," pointing out that additional ferroalloys the country produces include ferromanganese and ferrosilicon and that "in Witbank we have one of the largest vanadium plants in the world."

The $8.4 million plant of Transalloys Ltd., at Witbank began operating in May. Transalloys is a joint venture of Anglo American Corporation of South Africa Ltd. and Avesta Jernverks A.B. of Sweden. The initial annual capacity of the plant will be 14,000 tons of low carbon ferrochromium and 900 tons of ferrosilicon. The plant will produce entirely for export. South African industry contributed 90 percent by weight and 75 percent by value of materials used to build the plant.

Gold.—World gold production excluding Communist countries increased in 1964 for the 11th consecutive year. The increase was almost entirely the result of larger output in South Africa. Production there at 29,111,466 ounces, worth more than $1,000 million, set a new record for the 13th consecutive year, and was 71.7 percent of non-Communist output compared with 70.4 percent in 1963.

Companies that are members of the 74-year-old Transvaal and Orange Free State Chamber of Mines accounted for 28,604,000 ounces of total 1964 production. Both tonnage of ore milled by these companies and gold recovery per ton increased. Profits of members as a whole also continued to improve although operating losses were incurred by seven members. Two mines, Simmer and Jack Mines, Ltd., and Brakpan Mines, Ltd., were abandoned and two new mines were begun.

At the beginning of 1964, six gold mines had reached depths ranging from 2,586 meters (8,478 feet) to 3,430 meters (11,246 feet) as follows:

TABLE 6.—Salient statistics of gold and uranium production by members of the Transvaal and Orange Free State Chamber of Mines

	1963	1964
Number of operating mines	56	56
Ore milled ... thousand short tons	78,427	79,569
Gold produced.		
Gross weight ... thousand troy ounces	26,911	28,604
Per ton of ore milled ... troy ounces	0.3430	0.3595
Mines producing uranium ore	13	12
Ore treated for uranium recovery ... thousand short tons	12,582	11,556
Uranium oxide (U_3O_8) produced:		
Gross weight ... thousand pounds	9,065	8,890
Per ton of ore milled ... pounds	0.72	0.77
Working revenue excluding uranium ... thousand dollars	$948,521	$1,010,755
Average realized gold price per ounce [1] ... dollars	$35.03	$35.13
Working profit, gold and uranium ... thousand dollars	$438,193	$465,598
Taxation and mineral lease consideration payable to the government ... do	$163,520	$175,840
Net dividends ... do	$161,799	$173,547
Average number of employees in service:		
Whites	47,352	45,774
Nonwhites	381,440	380,749
Development footage including shaft sinking ... thousand feet	3,252	3,299
Payable ore reserves ... thousand short tons	174,025	180,420
Average grade of reserves ... troy ounces per ton	0.418	0.419

[1] Figures reported were 25.02 rands for 1963 and 25.09 rands for 1964.

Source: Union Corporation Ltd. report and accounts for the year ended 31st Dec., 1964.

Mine	Development		Stoping	
	Meters	Feet	Meters	Feet
Simmer and Jack	2,586	8,478	2,567	8,418
Robinson Deep	2,778	9,108	2,745	9,000
Western Deep Levels	2,941	9,673	1,799	5,900
Crown Mines	2,987	9,792	2,958	9,700
City Deep	3,204	10,504	3,124	10,242
E.R.P.M.	3,430	11,246	3,149	10,326

At yearend, 56 member mines were operating; tailings from 12 of these mines were being treated for recovery of uranium.

In November Kloof Gold Mining Company Ltd. began to sink the twin shaft system through which the new mine in the West Rand area will be opened. Both shafts will be sunk to 1,982 meters and if all goes well, they should be completed in less than 2 years. The lease area of the mine covers more than 42.8 square kilometers and is underlain by an estimated 90.7 million metric tons of Ventersdorp Contact reef (conglomerate) ore containing 40 million ounces of gold.[17] This new mine is expected to reach production within 4 years.

In April, Kinross Mines, Ltd., began work in the Evander area on the collars of twin, 7.0-meter diameter circular shafts, 45.8 meters apart, each of which will be sunk to a depth of about 1,677 meters. By yearend No. 1 shaft was 397 meters deep and No. 1A shaft was 153 meters deep. A mill will be built with initial capacity of 90,700 metric tons per month, to be increased to 136,000 tons per month when development results warrant it. The total cost of taking the mine to where further capital expenditures can be financed from profits is estimated at $37.8 million. At yearend $11.02 million had been spent.

Anglo American Corporation of South Africa Ltd., reported for 1964 that the Group of South African gold mines it controls produced 10.6 million ounces of gold, equal to 36 percent of the Republic's total production and a milestone in the history of the Group. The operating profit of the Group increased 13 percent, to $186.2 million, compared with 1963, and dividends declared increased by about $2.8 million to more than $67.2 million. Six mines in the Orange Free State contributed more than 75 percent to the total working profit. At yearend the Anglo American Group comprised 12 mines in all.

Toward the end of 1964, Anglo-Transvaal Consolidated Investment Co., Ltd., through its subsidiary, Middle Witwatersrand (Western Areas) Ltd., announced abandonment of its North Rand exploration venture. This program was started in 1962 to explore by diamond drilling an area extending in an arc north of Johannesburg from Delmas in the east through Pretoria to Klerksdrop in the west, a distance of more than 250 kilometers. Upper Witwatersrand beds underlie parts of the area. While gold values were encountered in some holes, no intersections of ore grade were obtained.[18]

Assuming no increase in the price of gold, informed opinion is that if the peak of South African gold production did not occur in 1964, it may occur in 1965. Subsequently, production is expected to level off soon, and thereafter gradually to decline as older and marginal mines are abandoned.[19] As mentioned earlier, the Economic Development Program for the Republic for 1964-69 estimates that in 1969 gold production will have increased by 15.7 percent from 1953, the base year for the program.

Iron and Steel.—Iron and steel manufacture continued to increase. Production of pig iron and steel ingot was respectively 18 percent and 10 percent higher than in 1963. The industry nevertheless failed to satisfy sharply rising demand, and there were large imports, steel shortages, and curtailment of exports. Imports were at the annual rate of $54.9 million, based on figures for the first 10 months of 1964. This compares with $32.1 million in 1963.

Toward yearend the government enacted two levies on both domestic and foreign steel, with the objective of preventing steep increases in steel prices. A levy of $6.44 on flat products and $5.60 on profiles, was enacted. Steel prices are quoted free on rail South African mill for both domestic and imported steel, with buyer paying freight to destination. Government controlled South African Iron and Steel Corp. (ISCOR) was administering the levy scheme in collaboration with the other members of the South African Rolled Steel Producers Coordinating Council.

---

[17] South African Mining and Engineering Journal (Johannesburg). V. 75, pt. 2, Nov. 20, 1964, p. 1407.

[18] U.S. Embassy, Pretoria, Republic of South Africa. Airgram A-146, Oct. 9, 1964.

[19] American Metal Market. V. 71, No. 252, Dec. 31, 1964, p. 16.

The outstanding development of the year in steel was that Highveld Development Co., Ltd., in which Anglo American Corporation of South Africa, Ltd., has a large interest, awarded a contract for construction of a $140 million iron, steel, and vandium plant at Witbank, Eastern Transvaal. The plant is expected to begin production in 1968. It will have a medium and heavy section rolling mill, oxygen steel facilities, and a continuous casting section. Initial annual capacity will be 318,000 tons of finished steel and 8.2 million kilograms of vanadium pentoxide. Ultimately annual capacity will be 544,000 tons of steel and 13.6 million kilograms of vanadium pentoxide. The plant is expected to earn $14 million in foreign exchange from overseas sales of vanadium pentoxide; steel output will be mostly for domestic consumption. An agreement was concluded with Vanadium Corporation of America which provides for Highveld to furnish Vanadium Corp. substantial quantities of vanadium pentoxide beginning in 1968.

ISCOR's major new facilities commissioned during the year at the Vanderbijlpart plant included: Two batteries of coke ovens (57 ovens each), sinter plant with daily capacity of 2,100 tons, a third blast furnace rated at 635,000 tons of pig iron per year, and a second oxygen plant with daily capacity of 100 tons of oxygen. Contracts were let for additional facilities. At Pretoria a second oxygen plant was contracted for. Completion of the whole expansion program by 1972 is designed to bring total steel production capacity to about 3.6 million tons annually.

African Metals Corp., Ltd. (AMCOR), at Newcastle (Natal) inaugurated its fourth blast furnace in November. Annual pig iron capacity of the furnace is 635,000 tons, which brings AMCOR's annual pig iron capacity at Newcastle to over 907,000 tons.

At yearend Rand Mines, Ltd., announced that it intended to build at Middleburg, South Africa's first plant for manufacturing stainless steel. This would be a joint venture with the U.S. company, Eastern Stainless Steel Corp.

Manganese.—Local sales and exports of manganese ore in 1964 were valued at $4.55 million and $15.5 million respectively. Compared with 1963, the export value was 8 percent higher; local sales recorded no significant change.

The Associated Manganese Mines of South Africa Ltd., (Associated), largest producer and exporter of manganese ore in the country, shipped from its mines during the year 556,000 tons of manganese ore (490,000 tons in 1963) and 742,000 tons of iron ore (494,000 tons in 1963). At the Adams and Devon manganese mines, which furnish the ore for Associated's subsidiary Ferroalloys Ltd., production was increased by the installation of additional compressors and acquisition of additional trucks and other equipment. At Ferroalloys Ltd., two new 9.6 megawatt electric arc furnaces were commissioned. At the end of the year the total capital investment in Ferroalloys was $8.8 million.

South African Manganese, Ltd. (SAM), produced 316,000 tons of ore at its Hotazel mine,[20] 21 percent less than in 1963. The decline in output largely resulted from difficulties encountered in handling highly ferruginous zones found in the manganese deposit. Exploratory drilling revealed that the problem would persist for some time and additional equipment was purchased to handle the waste material. In November 1963 SAM began commercial production from its new Mamatwan mine and in 1964 was selling the entire output to African Metals Corp. Ltd. (AMCOR), but inquiries for the ore were received from overseas customers to whom a small trial shipment was made. Completion of the Railway Administration's new ore loading facilities at Port Elizabeth both increased the ore loading rate and permitted SAM to accept larger vessels for manganese ore shipments. The supply of railroad cars for manganese ore was insufficient during most of 1964. As a result some overseas contracts negotiated on a calendar year basis would not be fully completed as called for, according to the Chairman of SAM in his statement of October 30, 1964.

Marble Lime and Associated Industries Ltd. increased sales of pyrolusite from its deposit in the Transvaal dolomites at Kapini in the Zeerust district. In April 1964 General Manganese Ltd. (GM) expected to close its battery grade manganese dioxide plant because it was not operating profitably. GM is a subsidiary of West Rand Consolidated Mines, Ltd.

Ferroalloys, Ltd., owned outright by Associated, commissioned two new electric furnaces in 1964, giving the company four electric furnaces in all. Profit in 1963 fell to $599,000 from $1.2 million in 1962, as a result of the decline in world prices for ferromanganese.

In June 1964 leading Japanese steel companies were investigating possibilities of importing ferromanganese from African Metals Corp. Ltd. (AMCOR), in Newcastle, Natal Province, despite opposition from Japanese manufacturers. South African ferromanganese was said to be $28 per ton cheaper than the Japanese product even when taking ocean freight charges and a 15-percent import tariff into account.[21]

Electrolytic Metal Corp. (Pty.) Ltd., wholly owned by West Rand Consolidated Mines, Ltd., decided to expand plant further, as a result of increasing demand for electrolytic manganese.

Platinum.—Rustenburg Platinum Mines, Ltd. (RPM), does not disclose production, being a very large producer of platinum group metals and the only producer in South Africa exclusive of nominal byproduct output by certain gold mines. RPM is estimated to have produced around 600,000 ounces of platinum group metals in 1964. This estimate is twice that made for 1963 and would put RPM first by far in free world platinum production.

For its financial year ending August 31, 1964, RPM reported in part as follows: "The reduced level of supplies of platinum made available from Soviet sources during the year gave rise to abnormal demands upon the company, with the result that the quantity of platinum sold by it was substantially greater than that sold in any previous years.

---

[20] In the year ending June 30, 1964.

[21] Johannesburg Star. June 3, 1964, p. 32.

Total sales greatly exceeded the quantity of metal brought into a marketable state during the year, and refined stocks which had been built up in previous years were in consequence heavily depleted. . . .

"In the case of most of the byproduct metals produced by Rustenburg, market conditions were such that they were readily sold as soon as refined. The output of refined platinum group metals increased during the closing months of the financial year and will continue to increase as a result of the progressive expansion in mine production."

Certain financial items appearing in the report of RPM for the year ended August 31, 1964, are as follows:

	Value, million U.S. dollars	
	1963	*1964*
Net revenue from sales of metals	10.6	23.7
Taxation and State's share of profits	2.9	8.9
Dividends declared	7.6	11.6

During the year the RPM published price for platinum was gradually increased, and on August 31, 1964, it was $89.95 per ounce compared with $79.80 per ounce a year earlier. Free market prices for restricted quantities of Soviet platinum put on the market were substantially higher than prices quoted by major platinum refiners. RPM also increased prices for certain other metals of the platinum group during 1964.

Both at the Rustenburg mine and the Union mine, production was substantially increased during the financial year, and by yearend capacity output, which informed speculation by Johannesburg stockbrokers puts at 200,000 tons of ore per month, had been reached. At the end of 1964 a program was in progress designed to expand production capacity by about 40 percent. Expenditure of more than $7.8 million was involved.

During 1964 RPM concluded an agreement with a consortium of Rand Mines and Engelhard Industries of New Jersey covering the Brakspruit platinum property which adjoins Rustenburg mine. Under the agreement RPM will furnish the consortium its platinum requirements for 20 years in return for mining rights in Brakspruit; for the present RPM will mine only its own ore.[22]

As of August 31, 1964, the outstanding shares of RPM were owned by three South African shareholding companies as follows:

Company	Number of shares held	Interest, percent
Potgietersrust Platinums Ltd	376,250	43.3
Union Platinum Mining Co. Ltd	151,933	17.5
Waterval (Rustenburg) Platinum Mining Co. Ltd	340,417	39.2
Total	868,600	100.0

[22] U.S. Embassy, Pretoria, Republic of South Africa. Airgram A-146, Oct. 9, 1964.

Uranium.—Exports of uranium (U_3O_8) in 1964 were valued at $81.3 million compared with $93.5 million in 1963.

Significant advances in uranium technology were made. These included the manufacture of uranium tetrafluoride and successful research into production of nuclear-grade uranium oxide from ion exchange eluates by modifying existing recovery plants located at mines. Attempts were made to produce UF_6 suitable for feed to a diffusion plant.

The reactor of the South African Atomic Energy Board at Pelindaba was expected to go critical early in 1965.

In July the President of the Transvaal and Orange Free State Chamber of Mines forecast that future demand for uranium for peaceful purposes eventually would exceed the demand of the 1950's when nuclear power was being exploited for defense. In October the Director of the Atomic Energy Board pointed to signs that the world uranium market will "open out rapidly from about 1968." In the highly competitive uranium market of the future, South Africa will be in a strong position to bid for contracts inasmuch as its uranium is a byproduct of gold mining.

Three of 10 uranium mills operating at the beginning of 1964 closed or were expected to close during the year: Blyrooruitzicht, Vogelstruisbutt, and Luipaardsvlei. These plants produced 822 tons of U_3O_8 or 20 percent of total output in 1963.

For its second 5-year development program the Atomic Energy Board will receive $21 million. The government will contribute $2.2 million annually, uranium producers $1.12 million, Electricity Supply Commission $700,000 and heavy engineering industry $140,000.

Vanadium.—The value of vanadium exports (fused oxide and some ammonium vanadate) rose to $5.9 million from $3.2 million in 1963. Local sales were $12,382 compared with $714 in 1963.

The announcement that Highveld Development Company Ltd. will supply vanadium pentoxide to the Vanadium Corporation of America under a long-term agreement makes certain the exploitation of the virtually unlimited reserves of titaniferous, vanadiferous magnetite ores found in the Bushfeld complex in Transvaal Province. The reserves contain more than 3 million tons of vanadium pentoxide. The size of South African production will depend on the rate at which the growing market for vanadium products increases and on the anticipated reduction in United States production at the conclusion of its Atomic Energy Commission program.[23]

NONMETALS

Asbestos.—Combined exports and local sales of the three varieties of asbestos that South Africa produces in large quantity were valued at $34.5 million, nearly $3.4 million higher than in 1963. The breakdown of values in 1964 by variety was as follows:

---

[23] Mining Journal (London). V. 263, No. 6736, Sept. 25, 1964, pp. 225, 233.

	Crocidolite	Amosite	Chrysotile
Exports [1]	$19,607,377	$10,866,716	$2,945,410
Local sales [1]	351,211	175,998	583,897
Total	19,958,588	11,042,714	3,529,307

[1] Export values are f.o.b. port of shipment; local sales value are f.o.b. mine.

The Government's National Resources Development Council issued a study on asbestos during the second quarter of 1964. Besides recommending research for all varieties of asbestos, the Council advocated preferential rail rates for cheaper fibers, investigation of greater use of asbestos in bituminous road mixes, and government help in developing reserves.[24]

The South African Bureau of Standards was giving top priority to establishment of test methods and laboratory facilities for improving the quality of asbestos produced for export. No standard grading methods existed despite the fact that South Africa was the world's third largest asbestos producer. The Bureau completed a preliminary investigation and approached certain organizations for evidence of the relative merits of different grading methods. In addition, it intended to send questionnaires to British Commonwealth standards groups. Information received would be referred to a South African committee.

Leading producers of Cape blue (crocidolite) asbestos formed an association during the year. The founders were Cape Blue Mines (Pty.), Ltd., Griqualand Exploration and Finance Company Ltd., and Wandrag Asbestos (Pty.), Ltd. Major objectives will be to standardize grades and terminology and to develop the exceptional inherent qualities of Cape blue asbestos. Close liaison between producers and users of the material would be required.

The first completely dust-free asbestos mill in South Africa began operating at the Penge mine of Cape Asbestos Co. (Pty.), Ltd., the world's only significant source of amosite asbestos. About 29 percent of installed horsepower in the mill is used to circulate and clean air for the dedusting operation. In addition, milling units to replace two old plants will be added to the new plant over the next 2 years at a cost of nearly $7 million. With these improvements annual output is expected to increase from 58,000 tons in 1964 to 90,000 tons or more.[25]

Diamond.—Total production of natural diamond (gem and industrial) was virtually unchanged from 1963. There was strong demand for gem diamond and prices improved. While volume of diamonds of South African origin increased by only 3.7 percent, value of such sales increased 21 percent, to $61,884,858. The breakdown of 1964 sales by source was as follows:

---

[24] U.S. Consulate General, Johannesburg, Republic of South Africa. Airgram A-7, July 7, 1964.

[25] South African Engineering and Mining Journal (Johannesburg). V. 75, pt. 1, No. 3709, Mar. 6, 1964, p. 487.

	Carats	Value	
		Total	Per carat
Underground mines	3,871,288	$40,952,246	$10.58
Alluvial mines	579,777	20,932,612	36.10
Totals and average	4,451,065	61,884,858	13.90

In the fourth quarter of 1964, Transvaal Province accounted for 57.5 percent of total diamonds mined underground and 26.6 percent of alluvial stones. The share of Cape Province, in which Kimberley is situated, was 39.8 percent for mine stones and 73.4 percent for alluvials. The balance of 1964 output came from Orange Free State Province (mine stones, 26,278 carats; alluvials, 189 carats).

The following are some salient features of the annual report and the Chairman's statement for 1964 of De Beers Consolidated Mines Ltd. and subsidiary companies with respect to diamond operations. For the fourth successive year the Central Selling Organization (CSO) achieved record sales, amounting to $373 million, $48.2 million higher than in 1963. Contributing to the improvement of nearly 16 percent were an average increase of prices for gem diamond of about 10 percent, made effective in February (5 percent increase in 1963), increased output from mines of the De Beers group, and to some extent increased purchase from other producers.

Diamond stocks held by the De Beers group at the end of the year were valued at $36.5 million compared with $26 million in 1963. The stocks at the end of 1964 were not considered excessive for efficient operation. Group profit for the year attributable to De Beers, after provision for taxes and deduction of minority interests, increased to $97.5 million from $69.9 million in 1963. Taxes absorbed $40.1 million, about 25 percent more than in 1963.

The net effect of various measures introduced in the government budget for 1965–66 was to increase combined tax and loan levy to 49.5 percent by 1966 from 47.25 percent in 1965. In addition, with one exception, the diamond export duty reduced by 10 percent the prices the companies receive for diamonds.

Demand for industrial diamonds was good but illicit large scale mining (and marketing) in the Congo (mainly of industrial diamond) continued to be a problem.

Research directed toward development of synthetic diamond for new industrial applications was intensified during the year. Ultra High Pressure Units Ltd. and Ultra High Pressure Units (Ireland) Ltd. manufactured in South Africa and Ireland, respectively.

The statement of the Chairman concluded as follows: "There is, moreover, good reason to think that world demand for gem diamonds is likely to increase. For all these reasons, therefore, I believe that the steps we are taking to raise production in our Group, and so increase the volume of goods available to the Central Selling Organizations, are fully justified and will not only make possible a larger volume of trade, but increases the stability of the industry." [26]

---

[26] De Beers Consolidated Mines, Limited. Statement by the Chairman, H. F. Oppenheimer. 1964, p. 6.

In South Africa the diamond production of companies of the De Beers group totaled 3,911,558 carats, of which Premier (Transvaal) Diamond Mining Company, Ltd., accounted for 2,224,012 carats and seven operations of De Beers proper account for the remainder. Costs per carat for De Beers operations ranged from $30.00 (Jagersfontein mine) down to $1.90 (Stadium Heap Plant, Kimberley Mine Plant, and Sundry Finds).

A lease agreement was executed between the Department of Mines of South Africa and De Beers with respect to the Finsch diamond mine of Finsch Diamonds (Pty.) Ltd. It provides that 60 percent of profits after recovery of capital expenditures will be paid to the government as lease consideration and tax. Of the remaining 40 percent accruing to De Beers, Finsch Diamonds will receive 40 percent in consideration of its transfer of the discoverer's certificate to De Beers. De Beers Holdings, Ltd. owns 80 percent of the capital of Finsch Diamonds. Work to bring the mine to production was under way. The Finsch diamond pipe is to be exploited as an open pit for several years.

Large-scale alluvial prospecting operations continued in Namaqualand, South Africa. Substantial reserves of diamonds were developed on the Dreyers Pan farm and preparations were in progress for mining both there and on Langhoote, an inland farm where a workable deposit occurs. Dreyers Pan is adjacent to Annex Kleinzee, where 1964 production was 105,533 carats at a cost of $12.89 per carat.

Fluorspar.—Production of fluorspar increased by 15 percent compared with that of 1963. According to a French publication,[27] the Republic and South-West Africa together have the largest known reserves of fluorspar on the African continent.

Nitrogen.—African Explosives and Chemical Industries (AECI) announced that during the period 1964–67, its investment in South African chemical industry will total $196 million. The principal project is a $22.4 million ammonia plant at Umbogintivini, Natal, to produce 160,000 tons annually, using as raw material refinery gas from the adjacent Shell Oil Co. refinery. Half the output will go into manufacture of fertilizers; the rest will be shipped to a urea plant at Modderfontein.[28]

Phosphates.—Phosphate Development Corp. Ltd. (FOSKOR) greatly improved its position in the year ending June 25, 1964, and declared its first dividend. The company mined 3.4 million tons of foskorite (2.5 million tons in 1963) and produced 387,300 tons of phosphate concentrates, making South Africa virtually self-sufficient in commercial phosphate. Byproducts recovered included 9,308 tons of copper concentrates averaging 39.7 percent copper. Study of recovery of magnetite and zircon was in progress, and pilot plant work on production of phosphate concentrate from Palabora tailings continued.

A $4.2 million expansion program to meet anticipated increased demand for phosphates was also in progress. The construction, expected to be completed by mid-1965, will raise plant capacity to 540,000 tons of marketable phosphates annually.[29]

---

[27] Mines et Métallurgie (Paris, France) No. 3587, September 1964, p. 402.
[28] Industries et Travaux D'Outremer (Paris, France). Jan. 1965, p. 96.

Soda Ash.—The new plant of Salt and Soda Corporation Ltd., about 40 kilometers from Port Elizabeth, was expected to be finished in 1965 at an estimated cost of about $11.2 million. It will produce annually 91,000 tons of soda ash, and bromine, iodine, potassium, and other by-products. The plant will make the Republic independent of imports of soda ash, which came from Kenya, a country that has embargoed trade with South Africa.[30]

Vermiculite.—The value of local sales and exports of vermiculite in 1964 by Transvaal Ore Company Ltd. (TOC), the only producer in the Republic, was respectively $128,500 and $2.04 million. The exports went to 33 countries. TOC became a wholly owned subsidiary of Palabora Mining Co. Ltd. during the year and increased output to about 136,000 tons was budgeted for 1965. Additional circuits will be installed, and large storage capacity at Lourenco Marques is planned.

MINERAL FUELS

Coal.—Reflecting boom conditions, production and local sales of coal again were at record levels. Sales of 42.9 million tons valued at $91.2 million increased 5.7 percent and 7.1 percent, respectively, compared with 1963. The value of exports at $9.8 million was $207,200 higher, despite a small decrease in volume. Trade embargoes imposed on South Africa by certain African countries did not significantly reduce coal exports to political divisions of Africa as a whole. The value of coal exports to Mozambique was $3,439,947, somewhat higher than in 1963.

In October Trans-Natal Coal Corporation Ltd. (managed by Federale Mynbou) opened its Usutu coal mine at Ermelo. The project as a whole comprises a complex of three related mines, which combined will be the largest coal mine in the world when in full operation, producing 464,000 tons per month. The main coal deposit is 16 kilometers long. The coal is for the Camden power station of the Electricity Supply Commission (government owned), situated 1.6 kilometers from the deposit.

In August, site levelling began for construction of South Africa's first Otto carbonization plant, which will produce 54,000 tons of coal char annually. Rhine Ruhur (Pty.) Ltd. will erect the plant at the Klippoortze Colliery, OGIES, of Trans-Natal Coal Corp. Ltd. Two retorts will be built, with provision for a third. Coal for the plant will come from No. 5 seam, which will be opened.

For use in its oil-from-coal facilities South African Coal, Oil and Gas Corp. Ltd. produced 2,296,030 tons of coal from its Sigma mine.

Petroleum.—In December the oil search in South Africa was given new impetus. A government-sponsored company, Southern Oil Exploration Corp., was to be formed to expedite the campaign. The company will be financed out of the strategic mineral resources development account established by the Strategic Mineral Resources Development Act, 1964. It was intended to allot about $14 million for use by the company, which would both prospect itself and provide financial, technical, and other assistance to other companies.[31]

---

[29] The Standard Bank Review (London), Feb. 1965, p. 24; South African Mining and Engineering Journal (Johannesburg), v. 75, pt. 2, Dec. 18, 1964, p. 1643.

[30] Mining Journal (London). Mar. 27, 1964, p. 23.

The need of South Africa to find domestic sources of petroleum is stressed in an article on the search for oil in the Republic that appeared in a South African publication.[32] The article compares oil statistics for January 1962 with those for January 1964. During that period the value of imports of crude oil rose from $1.45 million to $4.9 million; sales of gasoline increased from 1.229 million barrels to 1.419 million barrels, and of diesel oil from 444,000 barrels to 595,000 barrels.

At yearend, work on the oil pipeline from Durban on the Indian Ocean to the Rand was proceeding well. The 708-kilometer-long, 30.5-centimeter-diameter pipeline costing $28 million is expected to be functioning in 1966. It will be operated by government-owned South African Railways and initially will carry from 1,700 to 2,000 barrels per hour, and this amount could be increased. It seems unlikely that a reduction in inland prices of oil products will occur when the line begins deliveries because the Railways Administration must first recoup its loss of earnings from rail transport of fuel.[33]

SOURCE MATERIALS

Major sources for the chapter were despatches and other material from the U.S. Consulate General, Johannesburg, and other posts of the U.S. Foreign Service in South Africa; South African trade and technical journals; company reports and publications of the South African Government. The Quarterly Information Circular of the Department of Mines of the Republic of South Africa entitled "Minerals," was particularly useful for detailed statistics of production, local sales, and exports of raw minerals.

---

[31] South Africa Digest (Pretoria). V. 11, No. 49, Dec. 11, 1964, p. 6; Mining Journal (London), v. 263, No. 6749, Dec. 24, 1964, p. 490.

[32] South African Mining and Engineering Journal (Johannesburg). V. 75, pt. 2, No. 3747, Nov. 27, 1964, p. 1484.

[33] South African Scope (Pretoria). January 1965, p. 12.

The Mineral Industry of South-West Africa

By Charles L. Kimbell[1]

◆

THE mineral industry of the Territory of South-West Africa remained dominant in the area's economy in 1964. Production of diamonds, the Territory's foremost mineral commodity, and of smelter copper and lead increased significantly, more than compensating for declines in production of certain other mineral commodities, and maintaining the industry's position as the largest contributor to Territorial income and export earnings.

South-West Africa produced over 22 percent of world gem diamond output in 1964, and over 4 percent of total world output of gem and industrial stones. In addition to output of diamonds, blister copper, and refined lead (the country's most valuable products in terms of earnings) the Territory produced more than 10 percent of the world supply of vanadium and provided significant amounts of zinc and cadmium in concentrates, and of lithium minerals to world markets. South-West Africa also retained a place of potential prominence as a world germanium supplier, having ranked close to the Republic of the Congo (Léopoldville) as one of two major free world suppliers of the commodity through the first three quarters of 1963. However, the sole producer, Tsumeb Corp. Ltd., shut down its germanium plant in September of 1963 for economic reasons, not for a lack of ore.

Territorial income is not officially reported, and basic data used to compute it is not readily available; estimates of the gross Territorial income for 1964 range from $210 million[2] to about $260 million.

Value of local sales and exports of metals and minerals[3] totaled $128 million in 1964, compared with $87 million in 1963, and $73 million in 1962. In each of these years, the value of metal and mineral export sales was no less than 99 percent of total value of local sales and exports. The mineral industry employed about 13,000 persons in 1964, roughly 1 percent of the total population. About 5,000 of these were with Tsumeb Corp., 4,600 with Consolidated Diamond Mines of South-West Africa Ltd., 1,000 with South-West Africa Co. Ltd., and 900 with Marine Diamond Corp.

---

[1] Physical scientist, Division of International Activities.

[2] Where necessary values have been converted from the South African Rand (R) to U.S. dollars at the rate of R1=US $1.40.

[3] Republic of South Africa, Department of Mines. Quarterly Information Circular Minerals. October–December issues for 1962, 1963, 1964.

The most notable events in the Territory's mineral industry in 1964 were the full scale year-round operation of the copper and lead smelters and the lead refinery of Tsumeb, the marked increase in diamond output, and the continued suspension of Tsumeb's germanium output.

GOVERNMENT POLICIES AND PROGRAMS

On the basis of recommendations made by the Odendaal Commission, the administrator of the Territory of South-West Africa withdrew all areas of the Territory designated as proposed Homelands from the land area subject to pegging of claims for all minerals. This restriction was made effective on February 12 and was to continue in force until further notice.

PRODUCTION

The actual value of mineral and metal production is not reported for the Territory of South-West Africa, but the total value of exports and local sales, $127.9 million in 1964, is a reasonable measure of the value of production. The $39.8 million increase compared with the 1963 value level stemmed chiefly from increased and improved mechanization in the traditional onshore diamond area with a resultant production increase, increased activities in the offshore diamond areas, and full year operation of the copper smelter and lead plant at Tsumeb.

TABLE 1.—South-West Africa: Production of metals and minerals[1]

(Metric tons unless otherwise specified)

Commodity[2]	1960	1961	1962	1963	1964
Metals:					
Beryl, 10 to 12 percent BeO	375	229	144	54	6
Bismuth concentrate ... kilograms	475	743	220	r35	4,726
Cadmium, recoverable in concentrate[3]	177	123	109	114	99
Cesium ore, pollucite ... kilograms	-------	1,769	508	-------	-------
Copper:					
Ore[4]	3,900	4,904	1,452	-------	490
Metal:					
Recoverable, in concentrate	23,585	19,621	23,459	24,510	31,150
Blister	-------	-------	1,214	r20,813	28,511
Germanium:[5]					
In concentrates ... kilograms	19,051	10,523	25,125	-------	-------
In blister copper ... do	-------	-------	96	-------	-------
Dioxide ... do	-------	5,162	14,375	20,348	-------
Gold ... troy ounces	-------	-------	183	3	32
Iron ore	-------	-------	-------	15,029	9,481
Lead:					
Ore[4]	-------	100	-------	-------	-------
Metal:					
Recoverable, exported in concentrate	68,700	63,805	71,503	80,174	NA
Refined	-------	-------	-------	r1,812	47,795
Manganese ore, about 48 percent Mn	61,180	45,627	-------	-------	-------
Molybdenite ... kilograms	-------	-------	-------	486	-------
Silver, recoverable, in concentrates ... thousand troy ounces	1,406	1,118	1,301	1,143	1,436
Tantalite-columbite concentrates ... kilograms	4,712	2,930	5,244	2,069	669
Tin:					
Tin concentrate ... long tons	136	146	247	265	359
Tin-tungsten concentrate, about 37 percent Sn and 16 percent WO_3 ... long tons	483	580	575	753	659
Tungsten, scheelite concentrate	-------	6	2	-------	(6)
Vanadium, in lead vanadate concentrate	760	1,039	924	1,029	•1,055
Zinc:					
Ore[4]	-------	2,136	2,950	r8,334	2,447
Metal exported in concentrate	11,384	11,742	17,040	23,901	NA

See footnotes at end of table.

TABLE 1.—South-West Africa: Production of metals and minerals[1]—Continued

(Metric tons unless otherwise specified)

Commodity[2]	1960	1961	1962	1963	1964
Nonmetals:					
Aragonite .... kilograms	--------	181	6,350	--------	--------
Diamonds:					
Gem [e] .... thousand carats	885	816	800	1,076	1,387
Industrial [e] .... do	50	90	227	119	154
Total .... do	935	906	1,027	1,195	1,541
Feldspar	--------	90	472	2,232	1,923
Fertilizer materials, phosphate:					
Apatite	--------	--------	--------	--------	1
Guano	--------	937	583	1,375	418
Fluorspar	--------	--------	218	435	--------
Graphite	--------	--------	--------	--------	250
Lime	3,003	3,403	2,928	2,923	3,719
Lithium minerals:					
Amblygonite, 6 to 8 percent LiO_2	146	123	128	117	12
Lepidolite, 3 to 3.6 percent LiO_2	882	1,286	1,616	78	369
Petalite, 3 to 4 percent LiO_2	3,546	2,304	914	785	724
Marble	154	331	1,891	925	1,490
Mica	--------	--------	68	543	377
Salt	72,610	55,599	75,573	64,686	98,832
Semiprecious stones:					
Agate .... kilograms	--------	--------	--------	--------	2,268
Amazonite .... do	--------	--------	862	16,375	9,562
Amethyst quartz .... do	907	3,020	141,937	61,253	52,367
Jasper .... do	--------	--------	272	181	3,084
Opal quartz .... do	--------	--------	91	--------	--------
Rose quartz .... do	--------	--------	227	227	13,608
Tourmaline .... do	6	33	5	62	16
Chalcedony .... do	--------	13,698	3,647	1,016	3,225
Sillimanite and kyanite	1,304	2,722	1,512	--------	572
Slate	--------	--------	--------	1,189	642
Wollastonite	--------	--------	--------	--------	118

---

[e] Estimate. [r] Revised. NA Not available.

[1] Compiled from Minerals, a quarterly information circular of the Department of Mines of the Republic of South Africa, from company annual reports, and from Beerman's All Mining Yearbook, 1964.

[2] In addition, construction materials, such as clay and sand and gravel are presumably produced, but quantitative data are not available.

[3] For years ended June 30.

[4] Figures represent only that ore produced for export sale as such; they exclude ore produced and processed within South-West Africa to a concentrate or to metal. Thus, these quantities are in addition to ore used to produce concentrates, for which metal content is shown later, as well as ore used to produce metal listed later.

[5] The accuracy of the germanium figures is questionable.

[6] Less than ½ unit.

TRADE

The value of mineral exports from South-West Africa in 1964 reached a new record of over $127 million, almost 147 percent of the 1963 level and 176 percent of that of 1962. The increases in both 1963 and 1964 were attributable chiefly to greater exports of diamonds and of nonferrous metal smelter products.

Diamond sales, equivalent to exports, were valued at $47.9 million, $57.4 million, and $81.6 million in 1962, 1963, and 1964 respectively, and accounted for about 65 percent of total mineral export value in those years. The value of exported blister copper and refined lead from Tsumeb Corp. facilities, nil in 1962, totaled $11.4 million in 1963, and $29.5 million in 1964. Addition of Tsumeb metal export values to those for exports of ores, concentrates, and other materials by that company indicates that during 1962–64, Tsumeb accounted for about 32 percent of total mineral export value.

Data on general exports for the Territory have not been published since 1955, therefore exact comparison of mineral export value to total export value is impossible. However, it is certain that minerals have remained the first ranked major group of export commodities, accounting for over 50 percent of the total, well ahead of either fishery or agricultural products, the second and third most important groups.

Details on both general imports and on mineral and metal imports have not been reported separately from those of the Republic of South Africa since 1955, but, in view of the area's lack of developed commercial fuel resources, and lack of an industry to process other mineral materials into consumer goods, the major class of mineral imports almost certainly continued to be mineral fuels—petroleum products, coal, and coke.

Coal imports, largely if not entirely from South Africa, totaled about 275,000 tons annually through 1962, and presumably have increased to meet the needs of the Tsumeb copper and lead smelters.

TABLE 2.—South-West Africa: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1963
Metals:				
Beryllium ore	117	36	10	All to United States.
Bismuth concentrates..kilograms	352	204	4,632	All to United Kingdom.
Cadmium, contained in complex concentrates.[1]	552	480	320	United States 267; Belgium 212; Japan 1.
Cesium ore, pollucite...kilograms	508	--------	--------	
Copper:				
Ore and straight[2] concentrate	1,463	--------	317	
Contained in complex concentrates.[1]	22,290	11,676	5,928	United States 6,152; Belgium 5,325.
Blister	(3)	19,118	28,573	United States 12,580; Belgium 4,715.
Germanium:				
Contained in complex concentrates[1] kilograms	25,125	--------	--------	
Contained in blister copper. do	961	--------	--------	
Dioxide do	14,375	306	7,473	All to Japan.
Lead:				
Lead-vanadium concentrate	7,716	10,678	10,717	All to West Germany.
Lead-zinc ore and concentrate	--------	2,419	24,364	All to United Kingdom.
Contained in complex concentrates.[1]	70,224	68,083	14,385	United States [e]37,308; Belgium [e]30,582.
Refined metal	--------	434	41,789	All to Republic of South Africa.
Manganese ore	1,480	426	--------	All to Netherlands.
Molybdenite kilograms	--------	486	--------	All to United Kingdom.
Silver, contained in complex concentrates.[1] thousand troy ounces	1,253	634	329	United States 343; Belgium 278.
Tantalite-columbite kilograms	4,491	907	272	All to United States.
Tin, in straight concentrate. long tons	[r] 153	293	296	All to Republic of South Africa.
Tin-tungsten concentrate	539	773	691	All to West Germany.
Tungsten ore, scheelite	3	--------	--------	
Zinc:				
Ore	2,950	8,334	2,447	All to United Kingdom.
Straight concentrate[2]	15,909	18,749	14,420	West Germany 14,591; United Kingdom 3,309.
Contained in complex concentrates.[1]	[r] 19,944	20,289	14,414	United States 9,717; Belgium 8,137.
Nonmetals:				
Diamonds:				
Gem thousand carats	800	1,181	1,373	NA.
Industrial do	143	149	165	NA.
Total do	943	1,330	1,538	NA.
Feldspar	477	888	2,516	West Germany 785; Netherlands 103.
Fertilizer materials, phosphatic, guano.	240	NA	NA	
Fluorspar	93	--------	--------	

See footnotes at end of table.

TABLE 2.—South-West Africa: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1963
Nonmetals—Continued				
Lithium minerals:				
Amblygonite	132	179	--------	All to West Germany.
Lepidolite	1,339	286	491	Do.
Petalite	315	692	1,044	United Kingdom 532; Japan 156.
Lime/aragonite	4	--------	--------	
Mica	--------	577	227	United States 456; Belgium 61; Spain 50.
Salt	39,478	47,084	56,107	Republic of South Africa 45,157; Federation of Rhodesia 1,692.
Semiprecious stones:				
Amazonite kilograms	862	--------	4,808	
Amethyst quartz do	4,336	25,580	5,738	Republic of South Africa 18,597; West Germany 6,418.
Chalcedony do	2,150	--------	1,823	
Green quartz do	--------	2,749	--------	Republic of South Africa 1,778; United States 971.
Sodalite do	--------	--------	3,175	
Tiger's eye [4] do	1,361	2,658	3,629	All to West Germany.
Tourmaline do	--------	15	2	West Germany 14.
Sillimanite/kyanite	1,975	--------	555	

[e] Estimate. [r] Revised. NA Not available.

[1] As reported in source; apparently includes metal content of most if not all concentrates exported by Tsumeb. Gross weight of concentrates so classified in source was 1962—171,647 tons, 1963—152,003 tons, 1964-82,284 tons. Source does not classify Tsumeb concentrates on a comparable basis to company production figures.

[2] As reported in source; apparently includes only those concentrates having little or no recoverable byproduct or coproduct metals.

[3] Revised to none.

[4] Imported from Republic of South Africa and reexported.

Source: Department of Mines. Quarterly Information Circular Minerals. October-December issues or 1963 and 1964.

COMMODITY REVIEW

METALS

A total of 15 producers of metalliferous ores were recorded in South-West Africa at yearend 1964,[4] but of these only three were sizeable operators. The Tsumeb Corp., Ltd. remained the area's first ranked nonferrous metal producer, accounting for all of the territory's recorded output of cadmium, smelter copper, germanium, smelter lead, and silver, virtually all of its mine output of copper, and large quantities of total mine production of lead and zinc. The South-West Africa Co., Ltd. (SWAC) accounted for the balance of lead and zinc production, for the territory's entire output of vanadium, and for a part of its tin and tungsten production. Uis Tin Mining Co., Ltd. provided the major share of South-West Africa's tin output in 1964, and may have continued to produce beryl. Each of the remaining 12 companies was reported to produce ores of one or more of the following commodities, but it is not certain that each actually accounted for a share of the 1964 output: beryllium, bismuth, columbium, gold, tantalum, tin, and tungsten.

Copper, Lead, Vanadium, Zinc and Associated Metals.—*The Tsumeb Corp., Ltd.*—During the fiscal year ended June 30, 1964, the value of metal sales by the Tsumeb Corp. increased 40 percent over that of the previous fiscal year to nearly $44.8 million, while net profits were 46 percent over those of the previous year, reaching almost $10.6 million.

---

[4] Republic of South Africa, Dept. of Mines. Quarterly Information Circular—Minerals. October to December 1964. pp. 89–91.

The increases were chiefly the result of increasing smelter operations. Both figures, although markedly higher than in fiscal 1963, were considerably under the recorded highs of $53.5 million (metal sales) and $22.5 million (net profits) set in 1956. The provision in the accounts for South-West Africa's income tax rose sharply from $20,902 in 1963 to $4,878,563 in 1964, as a result of larger operating income and lower capital expenditures. (In South-West Africa, mine capital expenditures may be expensed entirely in the year in which incurred.)

Statistical details on Tsumeb's operation on a fiscal year basis have been summarized in tabular form.

Expansion of operation of the copper and lead smelters was planned, and should result in the eventual elimination of copper-lead concentrates and copper concentrates from the list of exported commodities, since at capacity operation, these plants should be able to process all of Tsumeb's output of these concentrates.

TABLE 3.—South-West Africa: Operations of Tsumeb Corp. Ltd.

	Year ending June 30				
	1960	1961	1962	1963	1964
Tsumeb mine and mill:					
Sulfide ore mined, metric tons	281,416	283,004	294,773	297,870	333,911
Sulfide ore grade:					
Copper, percent	3.56	3.08	2.86	3.10	2.69
Lead, do	14.17	11.85	12.21	14.26	10.98
Zinc, do	6.96	4.91	4.30	5.14	3.80
Oxide ore mined, metric tons	275,778	308,432	353,745	299,686	344,873
Oxide ore grade:					
Copper, percent	6.51	5.72	6.20	4.90	5.31
Lead, do	13.61	13.88	13.36	14.24	14.31
Zinc, do	3.60	3.83	3.23	3.34	3.71
Total ore produced and milled, metric tons	557,194	591,436	648,518	597,556	678,784
Milled ore grade:					
Copper, percent	5.02	4.46	4.68	4.00	4.02
Lead, do	13.67	12.91	12.84	14.25	12.66
Zinc, do	5.30	4.35	3.72	4.24	3.75
Concentrate production:					
Copper-lead concentrate:					
Gross weight, metric tons	160,205	128,880	128,079	137,700	132,605
Metal content:					
Copper, percent	10.64	10.33	10.16	7.99	7.21
Lead, do	42.60	45.85	49.17	52.88	55.93
Silver, grams per ton	247	167	189	158	116
Copper concentrate:					
Gross weight, metric tons	14,189	14,395	20,426	24,849	33,671
Metal content:					
Copper, percent	54.19	47.80	48.92	37.33	41.25
Lead, do	9.49	11.18	10.44	8.52	8.25
Silver, grams per ton	1,148	959	875	665	676
Zinc concentrate:					
Gross weight, metric tons	23,350	23,438	20,539	19,693	19,031
Metal content:					
Zinc, percent	58.72	55.53	55.96	58.07	57.35
Cadmium, do	1.76	1.45	1.40	1.56	1.38
Total concentrate production, metric tons	197,744	166,713	169,044	182,242	185,307
Mill recovery (in all concentrates):					
Copper, percent of metal in ore milled	93.80	87.79	91.27	91.26	89.45
Lead, do	96.23	93.54	94.04	95.45	93.72
Zinc, do	46.45	50.60	47.65	45.18	42.80

TABLE 3.—South-West Africa: Operations of Tsumeb Corp. Ltd.—Continued

	Year ending June 30				
	1960	1961	1962	1963	1964
Kombat mine and mill:					
Sulfide ore mined and milled:					
Gross weight ... metric tons	--------	--------	19, 591	182, 968	247, 354
Metal content:					
Copper ... percent	--------	--------	2. 40	3. 79	3. 99
Lead ... do	--------	--------	2. 60	2. 59	1. 41
Concentrate production:					
Copper concentrate:					
Gross weight ... metric tons	--------	--------	493	16, 940	21, 374
Metal content:					
Copper ... percent	--------	--------	37. 39	36. 40	42. 51
Lead ... do	--------	--------	6. 42	2. 47	3. 49
Silver ... grams per metric ton	--------	--------	NA	243	356
Lead concentrate:					
Gross weight ... metric tons	--------	--------	788	6, 727	4, 110
Metal content:					
Copper ... percent	--------	--------	18. 67	7. 66	7. 98
Lead ... do	--------	--------	38. 98	61. 96	61. 05
Silver ... grams per metric ton	--------	--------	NA	59	95
Copper-lead concentrate:					
Gross weight ... metric tons	--------	--------	476	--------	--------
Metal content:					
Copper ... percent	--------	--------	22. 50	--------	--------
Lead ... do	--------	--------	26. 25	--------	--------
Total concentrate production metric tons	--------	--------	1, 757	23, 667	25, 484
Mill recovery (in all concentrates):					
Copper ... percent of metal in ore milled	--------	--------	NA	96. 46	95. 37
Lead ... do	--------	--------	NA	96. 67	93. 63
Grand total ore output ... metric tons	557, 194	591, 436	668, 109	780, 524	926, 138
Grand total concentrate output ... do	197, 744	166, 713	170, 801	205, 909	210, 791
Smelting and refining:					
Copper smelter:					
Concentrates and other new metal-bearing material smelted ... metric tons	--------	--------	--------	38, 910	61, 810
Copper content of material smelted ... percent	--------	--------	--------	32. 78	40. 98
Blister copper produced ... metric tons	--------	--------	--------	11, 448	24, 573
Average assay of blister copper:					
Copper ... percent	--------	--------	--------	98. 78	98. 70
Silver ... grams per ton	--------	--------	--------	1, 246	1, 239
Lead smelter:					
Concentrates and other new metal-bearing material smelted ... metric tons	--------	--------	--------	--------	57, 640
Lead content of material smelted ... percent	--------	--------	--------	--------	52. 26
Refined lead produced ... metric tons	--------	--------	--------	--------	21, 507
Average assay of refined lead: lead ... percent	--------	--------	--------	--------	99, 998
Total recoverable metal content of concentrates produced:					
Copper ... metric tons	23, 585	19, 621	23, 459	24, 510	31, 150
Lead ... do	65, 588	59, 519	65, 222	72, 227	73, 943
Zinc ... do	11, 294	10, 563	9, 551	9, 507	9, 071
Cadmium ... do	177	123	109	114	99
Silver ... thousand troy ounces	1, 406	1, 118	1, 301	1, 143	1, 436

NA Not available.

In the Tsumeb mine, 3,710 meters of drifts, crosscuts, raises, and shafts were completed during fiscal 1964, and 6,770 meters of underground diamond drilling was done in exploration and development below the 30 level. At the Kombat mine, 2,550 meters of drifts, crosscuts, raises, and shafts were finished including completion of the 325 meter deep No. 3 shaft at the East orebody and a 910 meter advance of the 6 level haulage drift from the West orebody toward the Central and East orebodies. Ore reserves as of June 30, 1964, were estimated at:

	Thousand metric tons	Grade, percent		
		Copper	Lead	Zinc
Positive ore:				
Tsumeb mine	7,743	5.10	11.91	3.29
Kombat mine	1,065	3.03	1.84	
Total	8,808	4.85	10.69	2.89
Probable ore:				
Tsumeb mine	1,115	4.50	5.60	2.10
Kombat mine	2,358	2.26	3.07	
Total	3,473	2.98	3.88	.67
Grand total	12,281	4.32	8.76	2.26

In addition to exploration work in the mines, Tsumeb Corp. drilled 3,707 meters of exploratory holes in its Gross Otavi Mining Area holdings and results reportedly were sufficiently encouraging to warrant further exploration.

During fiscal 1964, twelve 36-inch flotation cells were added to the Kombat mill to treat oxide ores from the upper section of the orebody. No other major changes in beneficiation facilities were reported, but mill operations were increased to 7 days per week at Tsumeb, mainly to handle greater tonnages of oxide ore. Metallurgical studies at the Tsumeb mill emphasized treatment of the more refractory ores that were being encountered at depth.

The 32,660 ton-per-year capacity copper smelter, with its initial break-in period past, operated without major problems through the 1964 fiscal year, but the 81,650 ton-per-year lead smelter placed in operation in late 1963 underwent numerous alterations in design and equipment (particularly in the blast furnace section), as operational problems were encountered.

Operation of the silver refinery had not started by July 1964; it was being delayed pending accumulation of sufficient feed bullion. Similarly, operation of the 180 ton-per-year cadmium plant had not started on a commercial basis because recirculation of lead baghouse dust had not yet increased cadmium content of feeds to satisfactory levels. The 15 ton-per-year germanium plant, operation of which was suspended in September of 1963 for economic reasons, remained on standby basis at mid-1964, and germanium dioxide exports recorded during late 1963 and all of 1964 presumably came from stocks. The sulfuric acid plant with an annual production capacity of about 4,100 tons of acid, operated to meet demand for a part of fiscal 1964, but full year operation was not necessary because anticipated demand from the cadmium plant did not materialize.

The arsenic plant, with a capacity of about 3,600 tons of arsenic trioxide per year, reportedly operated satisfactorily, removing arsenic from lead plant speiss and from copper smelter flue dust. Arsenic trioxide produced could become competitive with that produced by Sweden and other traditional producers.

The South-West Africa Co., Ltd. (*SWAC*).—Total ore output of the Berg Aukas lead-vanadium-zinc mine of SWAC increased to 173,122 tons in 1964 and 113,942 tons of ore were milled. Comparison of concentrate and direct shipping ore output for 1963 and 1964 as given below reflects the declining vanadium content of the ore at depth:

	Output (metric tons)	
	1963	1964
Concentrates:		
Lead-vanadium	10,206	9,915
Zinc silicate	9,005	11,022
Zinc sulfide	9,394	7,185
Zinc-lead sulfide		7,548
Subtotal	28,605	35,670
Ore: zinc-lead sulfide and oxide	8,555	7,548
Total	37,160	43,218

During the year, the mine's shaft was deepened from the 510-foot level to the 860-foot level, as a part of the development program to exploit orebodies below the 5 level (510 feet). Reserves were reported to comprise 305,000 tons of proved ore analyzing 1.56 percent vanadium pentoxide (V_2O_5), 7.4 percent lead, and 33.1 percent zinc; and 595,000 tons of indicated ore containing 0.85 percent V_2O_5, 3.8 percent lead, and 37.3 percent zinc.

Other Operations.—Three small copper mines were reported reopened during 1964. These included the Onganya mine of Emka Mining and Trading Co. Ltd., the Khan mine of Khan Mine (Pty.) Ltd., and the Rehoboth Gebiet property of Klein Aub Koper (Mpy.) (Edms.) Bpk., where a new shaft was commenced.

Iron Ore.—The Tsumeb Corp. continued to operate South-West Africa's only iron mine, the Kalkfield property, to supply iron ore as a flux to its copper and lead smelters. Output in 1964 was somewhat lower than in 1963, the first year of production, presumably because 1963 output had been set in excess of requirements to provide operating stocks.

Manganese.—Reports indicated that the Otjosondu Hill manganese mine about 200 kilometers northwest of Windhoek would be reopened in 1965. The property, operated through 1961 by S.A. Minerals Corp. for Johannesburg Consolidated Investment Co. and other stockholders, reportedly is to be reopened by Walvis Bay Mining (Pty.) Ltd., who, using selective mining methods and sorting, will produce a high grade concentrate for sale to West Germany.

Tin and Tungsten.—The gain in tin production in 1964 was ascribed largely to expansion of operations at the open pit Uis mine of Industrial Minerals Exploration (Pty.) Ltd., a firm owned by South African Iron and Steel Corp. (ISCOR). The $2.8 million expansion program at Uis initiated in 1963 and continued through 1964, has as its goal raising annual mine output to over 2 million tons of ore and waste rock, and annual milling capacity to over 900,000 tons, making possible an annual output of about 850 long tons of tin in concentrate, compared with the 156 long ton annual capacity before expansion began in 1963. In 1964, 242,226 long tons of ore were mined and milled and concentrate output totaled 296 long tons. Tin reserves in the mine area reportedly approximate 17.9 million long tons of 0.13 percent tin ore, assuming a stripping ratio of 1 : 1.

Output of tin-tungsten concentrates from the open pit Brandberg West mine of SWAC declined in 1964 to 659 long tons, apparently for economic reasons, in spite of better metal prices. Mine output totaled 352,538 tons of ore, of which 85,959 tons were milled. Ore reserves were estimated at about 1.6 million tons containing about 0.17 percent tin and 0.06 percent WO_3.

NONMETALS

Diamond.—The Consolidated Diamond Mines of South-West Africa Ltd. (CDM) continued to dominate the field of diamond mining in South-West Africa in 1964, producing over 81.3 percent of the Territory's total recorded output, but accounting for a significantly smaller share of the total than in 1963, when its share of the total was over 95.2 percent.

TABLE 4.—South-West Africa: Salient diamond industry statistics

Company	Overburden stripped (thousand cubic meters)		Gravel treated (thousand cubic meters)		Diamond recovery (carats)	
	1963	1964	1963	1964	1963	1964
Consolidated Diamond Mines of South-West Africa Ltd.:						
Mining	7,859	10,789	3,071	3,614	1,137,998	1,253,453
Prospecting:						
Normal	111	--------	--------	--------	52	--------
Foreshore	--------	--------	--------	--------	--------	192
Total	7,970	10,789	3,071	3,614	1,138,050	1,253,645
Marine Diamond Corp:						
Mining	--------	--------	28	142	53,671	286,571
Prospecting	--------	--------	1	1	73	80
Total	--------	--------	29	143	53,744	286,651
De Beers Consolidated Mines Ltd.:						
Mining	25	29	6	3	1,245	554
Prospecting	--------	--------	--------	1	--------	14
Total	25	29	6	4	1,245	568
Westies Minerale (Edms.) Bpk	NA	NA	[1]	[1]	1,069	405
Tidal Diamonds S.W.A. (Pty.) Ltd.:						
From old dumps	--------	--------	--------	NA	--------	205
Prospecting	--------	--------	--------	[1]	--------	2
Total	--------	--------	--------	NA	--------	207
Desert Diamonds (Pty.) Ltd	NA	NA	1	[1]	540	64
Sundries	NA	NA	NA	NA	1	4
Total	XX	XX	XX	XX	1,194,649	1,541,544

NA Not available. XX Not applicable.

[1] Less than ½ unit.

C.D.M.—The significant increase in output by CDM was attributed[5] to the start of operations of two new screening plants during the year, raising the total of operating screening plants to 15 at yearend. Three additional plants were being erected. The five new installations have all been equipped with yuba jigs, primary concentrators that greatly reduce the amount of concentrate to be shipped to the central recovery plant. Addition of such jigs to all older plants was planned. Completion of the additions to company facilities and operation of these facilities at capacity was expected to raise production levels to 1.5 million carats per year. To achieve this output, about 700,000 tons of diamondiferous gravels will have to be processed each month, and this will require removal of 2.5 million tons of overburden monthly.[6] This reportedly will result in the use of more heavy earthmoving equipment—large front-end loaders for mining (replacing power shovels) and tandem bowl-scrapers for overburden removal. Testing of the Vacuveyor as a bedrock cleaning machine was completed and results were successful enough to lead the company to order 6 more of these machines for 1965.

---

[5] Anglo American Corp. of South Africa Ltd. 48th Annual Report. Appendix 6, p. 69.

A new heavy media separation plant, using Wedag wheels and hydrocyclones to effect separation was put into operation during the year.

At yearend, the company's reserve of diamondiferous gravel was estimated at 68.9 million cubic meters, containing 21.1 million carats.

Increased volume of sales and higher average per carat price ($60.97 in 1964 compared with $47.03 in 1963) were reflected in an increase in annual profits from $55.6 million in 1963 to $58.2 million in 1964.

Other operators.—The Marine Diamond Corp., operating in the sea concession area of South-West Africa Prospekteerers between the mouth of the Orange River and Diaz Point, commissioned a third mining ship, the *Colpontoon*, in September. The prospecting ships *Emerson K* and *Rockeater* continued exploratory work. Output was reportedly adversely affected by weather conditions but in spite of this was more than 5 times that of 1963 and an estimated 99 percent of output was of gem quality.[7]

Cost of recovery and sale prices of output were:

Field cost per carat:	*1963*	*1964*
Mining	$16.80	$7.14
Prospecting	7,898.80	4,390.48
Average	29.60	8.68
Sale value, average per carat	28.40	29.40

The decline in output by the De Beers Consolidated Mines Ltd. operation in its area between the Ugab and Hoanib rivers was due to a reduction in the quantity of gravel mined and to lower yield of diamond per cubic meter processed.

Exploratory work continued in the Westees Minerale (Edms.) Bpk. grant area between the Hoanib river and 18° south latitude resulted in far less satisfactory recoveries than in 1963.

Virtually all of the 1964 output of Tidal Diamonds S.W.A. (Pty.) Ltd. was recovered from old tailings and concentrate dumps in the company's holdings at Saddle Hill. Limited exploration in the same general area resulted in the recovery of 1.5 carats from 159 cubic meters of gravel treated. This firm was formed in 1964 by CDM (two-thirds interest) and Tidewater Oil Co. (one-third interest). Geophysical exploration was carried out in the offshore grant areas from a chartered ship, *Xhosa Coast*, and erection of radar beacons for use in location determination was commenced preparatory to the start of seabed sample collecting planned for 1965 using the prospecting ship, *Rockeater*.

---

[6] Mining Journal (London). June 1965, p. 185.

[7] South-West Africa Administration, Mines Division. Annual Report of the Inspector of Mines for the Year Ending 31st December, 1964. Windhoek, p. 12.

Desert Diamonds (Pty.) Ltd. continued limited exploration in its coastal grant area between the Ugab and Unjab rivers. The decline in output compared with 1963 was attributable both to the lower level of processing and to a poorer recovery rate. The company's screening plant was modified during the year, possibly contributing to the lower processing rate. A sizeable expansion in prospecting operations was reportedly planned for 1965.

Oranje-Kunene Diamante Bpk. carried out reconnaissance prospecting in its several sea grant areas to single out areas for more intensive work in the future. No diamonds were recovered.

Rand Mines S.W.A. Exploration Co. (Pty.) Ltd. conducted a systematic prospecting program including mapping, trenching and pitting in their 8 kilometer coastal strip grant area between Cape Cross and the Ugab river. No diamonds were found.

Lithium Minerals and Associated Materials.—S.W.A. Lithium Mines (Pty.) Ltd. mined about 3,600 tons of ore of which about 2,700 tons were treated, yielding 6 tons of amblygonite, 4.3 tons of beryl, 47 tons of mica scrap, 4,714 kilograms of bismuth, and 194 kilograms of columbite as well as South-West Africa's total production of petalite and lepidolite.

Salt and Soda Ash.—Of total 1964 salt production, 93,324 tons were produced from seawater at the Otjivalunda salt pans by South-West Africa Salt Company (Pty.) Ltd., compared with 59,589 tons in 1963. This firm decided to establish byproduct production of soda ash from its salt operations, and to this end, a lot was railed to the Republic of South Africa for test purposes.

Rock salt output by R. Gossow totaled 4,973 tons in 1964 compared with 4,364 tons in 1963. South West Transport (Pty.) Ltd. produced 470 tons of rock salt from mining areas White Lady I and II.

MINERAL FUELS

South-West Africa's mineral fuel requirements continued to be met wholly by imports. Data on petroleum requirements are not available; coal and coke needs presumably increased from the 300,000 tons per year estimated for 1963 as a result of the expansion of smelting operations at Tsumeb. Etosha Petroleum Company (Pty.) Ltd. drilled a stratigraphic test hole to a depth of 6,163 feet just north of the Etosha Pan with negative results. The Artnell Exploration Company of the United States undertook no further drilling operations.

The Mineral Industry of the Republic of the Sudan

By E. Shekarchi[1]

❖

DESPITE record activity by the Geological Survey of Sudan, occurrence of a wide variety of minerals, and continuing efforts to discover additional deposits and expand production of known deposits, the mineral industry of Sudan remained of minor importance in the world mineral economy. In 1964, as in previous years, the productive activity consisted chiefly of small scale exploitation of gold, chromite, iron ore, gypsum, and simple construction materials. Silver production was recorded for the first time.

In 1964, mineral production including cement had an estimated value of only $470,000.[2] The gross national product (GNP) was $1,280 million, a decrease of about 1 percent from that of 1963. Also, per capita GNP decreased from $102 in 1963 to $98 in 1964. With a reported population growth of 2.8 percent in 1964 and for an estimated population of 12.8 million, there were only 4 million in the total labor force, and of these, the mineral industry employed only a very small part.

GOVERNMENT POLICIES AND PROGRAMS

The construction of the Roseires Dam progressed satisfactorily in 1964. The dam construction, financed by the Federal Republic of Germany, is scheduled to cost $89 million and will provide enough water from the Blue Nile to irrigate 1,250,000 acres. This facility is scheduled for completion in 1967. Also, establishment of an electric powerline from Roseires Dam to Khartoum progressed steadily during the year.

The Sudan continued to be handicapped by its entirely inadequate transportation system. This inadequacy contributed to the low level of mineral development. An agreement was reached during 1964 between the International Bank for Reconstruction and Development (IBRD) and the Government of Sudan for a $32 million loan to the Sudan Railways. Although formal signing of the agreement was apparently being deferred until an elected government was in power, it was understood that the loan would be used to install additional sidings and replace part of the Khartoum-Port Sudan track. Also during 1964, Japan financed a survey for the extension of the railway from Nyala to Geneina near the Sudan-Chad border.

---

[1] Foreign minerals specialist, Division of International Activities.

[2] Where necessary, values have been converted from Sudanese pounds (£S) at the rate of £S1 equals US$2.87.

Construction of the U.S. Agency for International Development (AID) financed 200 kilometer Khartoum-Wad Medani highway was underway with 48 kilometers paved by the end of 1964.

The end of 1964 also witnessed the signing by AID and the Government of Sudan of two additional agreements for roads that will accelerate the development of lands for mining and other uses along the White and Blue Nile.

During 1964 construction of two new berths equipped with 6-ton portal cranes was begun in the highly congested and main port of Sudan.

PRODUCTION

Overall production of minerals in 1964 was below 1963 output. Production of a small quantity of silver was reported for the first time in 1964. Details of silver production were not available, and it is not known whether it was recovered as a byproduct or was obtained from ore mined primarily for silver. Small quantities of construction material—clays, sand, gravel, and building stone—were produced locally; however, no statistical data were available.

TABLE 1.—Sudan: Production of metals and minerals

(Metric tons unless other specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Chromite	---	---	---	[1] 20,000	[1] 17,000
Gold troy ounces	2,116	1,226	1,500	[e] 900	877
Iron ore	3,000	---	20,000	---	300
Silver troy ounces	---	---	---	---	40
Nonmetals:					
Cement [2] thousand tons	121	83	85	104	104
Gypsum	---	5,500	7,502	[e] 4,520	4,520
Salt thousand tons	54	53	69	37	37
Vermiculite	---	50	[e] 50	---	---
Wollastonite	20	---	---	---	---

[e] Estimate.

[1] Data reported are not official and may represent mine shipments rather than actual production.

[2] Exclusive of imported clinker ground locally as follows: 1959, 27,500 tons; 1960, 32,485 tons; 1961, 22,609 tons; 1962–64 none.

TRADE

In 1963, the Sudan imported mineral and metal commodities excluding fertilizers valued at $36 million about the same as in 1962. Major categories of imports in 1963 as in 1962 were fuels ($19 million); iron and steel ($10 million); and nonmetals ($4.8 million). Exports of metals and minerals in 1963 valued at about $330,000, were below the 1962 level.

TABLE 2.—Sudan: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Iron ore	2,000	----------	
Ferrous scrap	----------	1,732	United Arab Republic 1,632; United Kingdom 100.
Gold troy ounces	419	----------	
Nonmetals: Salt	525	514	Ethiopia 277; Chad 188.

TABLE 3.—Sudan: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys	467	663	United Kingdom 561; Japan 39.
Copper and alloys	598	404	United Kingdom 171; Netherlands 70; Yugoslavia 63.
Gold troy ounces	313	----------	
Iron and steel:			
Iron ore	4	----------	
Pig iron	117	6	All from Italy.
Scrap iron	4	19	Chad 15; Nigera 4.
Semimanufactures	108,244	63,204	Belgium 15,626; United Kingdom 9,542; West Germany 8,970; U.S.S.R. 5,353.
Lead and alloys	58	153	United Kingdom 75; West Germany 36.
Tin and alloys	36	22	Yugoslavia 18; United Kingdom 3.
Zinc and alloys	96	197	Belgium 86; Canada 50; Poland 28.
Nonmetals:			
Abrasives	140	394	Denmark 162; Italy 105; Greece 59.
Cement	209,836	278,535	Poland 55,687; Yugoslavia 52,257; Rumania 51,687; Hungary 19,930.
Chalk	116	----------	
Clays	50	305	United Kingdom 119; West Germany 75; Italy 69.
Fertilizers:			
Potassic	----------	40	All from United Kingdom.
Phosphatic	1,162	63	Netherlands 43; Belgium 20.
Nitrogenous	66,152	18,663	West Germany 6,243; U.S.S.R. 3,990; United Kingdom 2,401.
Graphite	25	10	United Kingdom 9.
Gypsum	204	404	Cyprus 313; United Arab Republic 80.
Lime	371	603	Netherlands 250; Belgium 100.
Salt	78	3	All from United Kingdom.
Stone, precious and semiprecious	11	20	All from West Germany.
Sulfur	61	2	All from West Germany.
Mineral fuels:			
Coal	8,394	17,913	All from Poland.
Coke	1,501	600	All from West Germany.
Petroleum refinery products:			
Gasoline	84,390	91,297	NA.
Kerosine	62,494	69,769	Do.
Distillate fuel oil	142,374	144,160	Do.
Residual fuel oil	207,070	198,651	Do.
Lubricants	12,311	13,691	Do.
Asphalt and bitumen	8,679	7,881	Do.
Others	60	184	Do.
Total	517,468	525,633	

COMMODITY REVIEW

METALS

Chromite.—Chromite deposits in the Ingessana Hills region, about 80 kilometers southwest of Roseires, near Bau, reportedly were not operated commercially in 1964. Although the first shipment of 8,000 metric tons to the world market assayed above 55 percent Cr_2O_3, supply of ore from some other sources in the free world and U.S.S.R. set back exploitation of these deposits in 1964. Geologic work proving more reserves and systematic exploration continued during the year. According to Mining and Trading Co. of Khartoum, the sole owner of the chromite deposits in Ingessana region, there were about 10,000 tons stockpiled at Port Sudan, and the company felt that if a good market is found it would be able to supply 50,000 to 60,000 tons of 55 percent Cr_2O_3 content ore annually.

Copper.—The only known copper deposits of Sudan at Hofrat-en-Nahas in southern Darfur province, 320 kilometers from El Da'ein (the nearest point on the existing railway), remained unexploited in 1964. According to a Sudan Geological Survey report, the deposit contains 10 million tons of ore reserve with 2.78 percent copper content. In 1964 the African Mining Corp., owner of the copper deposits, had the Krupp Co. of West Germany analyze the copper ore to find out how it can best be concentrated.

Reportedly, six mining experts from the Japan Mining Co. (Nippon Kogyo K.K.) visited Hofrat-en-Nahas copper deposits in 1964. Over a period of 2 years, this group was to make about 20 exploration drillings to determine the potential of the ore bodies and the extent of the deposits.

Iron Ore.—Iron ore mining, with a limited output of 300 tons in 1964, was negligible compared with that of 1962, the last year production was reported. Reportedly, a joint Sudanese-Yugoslav company was exploring hematite deposits with more than 50-percent iron content in the Red Sea hills north of Port Sudan. Initially, the company planned to export annually 50,000 tons of ore to Yugoslavia, with an expansion target of 150,000 tons annually.

Manganese.—Manganese operations remained inactive during 1964. A delegation from the United Arab Republic visited the manganese mines near Geheit and Sinkat in Kassala province to participate in exploration and development of manganese ore. However, by the end of 1964 no details of an agreement, if any, were available. The grade of ore is said to be about 50 percent manganese but mining costs would be high and transportation to Port Sudan would be difficult.

NONMETALS

Cement.—The Yugoslav firm, Industriska Gradnje (INGRA), was awarded a $2.64 million contract to construct the buildings for housing a 100,000-ton dry-process oil-fired cement plant. Previously, the Yugoslavs had won a $2.87 million contract to supply and install the machinery. The Nile Cement Co., which is building the cement mill, is a private concern in which the Government of Sudan has a 15-percent equity interest. Production will start early in 1966.

At yearend, the Sudan had one operating plant at Atbara with an annual capacity of 180,000 tons. Even with completion of the new plant, the Sudan will still have to import some of its requirements estimated at 350,000 tons annually.

MINERAL FUELS

Petroleum.—Construction of the Port Sudan refinery, underway since the summer of 1963 by Shell-British Petroleum interests, continued during 1964. Apparently good progress was made with the construction of the processing units and powerplant. However, work on the oil tanks, refinery buildings, roads, and instrumentation was behind schedule. The refinery is built on the southern side of Port Sudan, approximately 5 kilometers from the harbor on an area of 200,000 square meters. The refinery will have an annual capacity of 20,000 barrels per day of crude oil. The main processing facilities to be installed include a distillation unit, a platformer, and a hydrotreater.

AGIP Mineraria (Sudan), Ltd., after unsuccessful exploration in 1963, did not continue exploration in 1964 although the Government renewed prospecting rights of the company for 2 more years.

The Mineral Industry of Tunisia

By William C. Henkes[1]

◆

TUNISIA's mineral industry was a relatively bright spot in the country's economy for 1964. In production of metals and minerals, eight of the principal commodities showed modest to very good percentage increases. Probably the 16-percent increase in phosphate rock and 11-percent increase in iron ore output represent the most important factors insofar as export credits were concerned, but the growth in cement, lime, and clay output had indirect benefits since their use saved much of the foreign exchange formerly expended for these construction materials.

Employment in the mining industry in January 1965 was 11,968 as compared with 8,334 in January 1964, an increase of about 44 percent. The largest increase was in the phosphate sector where employment rose by more than 3,400 workers.

Discovery of petroleum in the country and operation of the Bizerte refinery will show long-range benefits to the economy.

Mineral production was valued at about $44 million,[2] slightly more than 10 percent of the gross domestic product.[3] Phosphate rock represented by far the most valuable single mineral commodity, worth nearly $21 million.

Noteworthy mineral industry developments included the completion ahead of schedule of the $14.3 million NPK Engrais superphosphate plant[4] at Gafsa in October; first-year production of nearly 600,000 tons of petroleum products by the new Bizerte refinery; and on-schedule construction of the El Fouladh steel mill which was planned to begin operations in 1965.

GOVERNMENT POLICIES AND PROGRAMS

Because of the virtual completion in 1963 of the Government's program of nationalization of mines, there was very little private foreign investment in the country's mineral industry in 1964; the NPK Engrais superphosphate plant, petroleum prospecting, the Bizerte petroleum refinery and the Tunis aluminum factory were the significant exceptions.[5]

---

[1] Petroleum engineer, Division of International Activities.

[2] Where necessary, values have been converted from Tunisian dinars (DT) at the rate of DT1=US$1.905.

[3] On September 28, 1964, the Tunisian dinar was devaluated from a par value of US$2.38 to US$1.905.

[4] Privately owned: 58 percent Swedish Forenade, 17 percent U.S. Freeport Sulphur, and 25 percent International Finance Corp.

[5] U.S. Embassy, Tunis, Airgram A-365, Mar. 17, 1965.

Faced with a foreign trade deficit mounting to record proportions, the Government of Tunisia instituted a broad austerity program during the second half of 1964. This included reduced government administrative expenditures, "frozen" wages for another year, devaluation of the dinar, and restrictions on credit, both private and public.

The Government initiated a 3-year program of geological exploration and mapping in central Tunisia designed to find new areas for mineral activity and possibly to improve the mines now existing in the area. Financing was to be by a United Nations Special Fund grant of $850,000 and $533,000 by the Tunisian Government.

PRODUCTION

Most of the mineral commodities of Tunisia showed increases in production. Cement, phosphate, and lime had the largest increases on a percentage basis.

TABLE 1.—Tunisia: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Iron ore ... thousand tons	1,035	[r] 879	[r] 765	[r] 865	939
Lead:					
Concentrate, metal content	18,131	17,348	13,550	[r] 13,808	13,421
Metal	19,862	18,451	15,828	12,801	11,461
Antimonial	379	1,201	2,087	2,833	1,066
Mercury ... 76-pound flasks	166	54	-----	-----	87
Silver ... troy ounces	34,401	69,767	[r] 24,627	9,034	12,635
Zinc concentrate, metal content	4,261	4,169	[r] 4,288	4,365	3,252
Nonmetals:					
Cement ... thousand tons	405	[r] 329	363	361	455
Clay, for brick and tile	NA	NA	NA	40,000	44,000
Fertilizer materials, phosphatic:					
Phosphate rock ... thousand tons	2,096	1,982	2,097	2,367	2,751
Hyperphosphate	60,800	69,300	34,500	85,700	101,221
Gypsum	13,790	16,000	16,000	18,000	-----
Lime	125,880	120,655	128,748	143,000	174,961
Salt ... thousand tons	166	162	[r] 175	301	214
Mineral fuels:					
Fuel briquets[e] ... do	5	-----	-----	-----	-----
Gas:					
Gashouse ... do	16,000	16,092	16,128	16,025	14,448
Natural,[r] marketed ... thousand cubic meters	7,136	7,261	7,166	7,297	7,840
Petroleum refinery products:					
Gasoline	-----	-----	-----	-----	92,408
Kerosine and jet fuel	-----	-----	-----	-----	42,185
Distillate fuel oil	-----	-----	-----	-----	175,680
Residual fuel oil	-----	-----	-----	-----	254,616
Liquefied petroleum gas (LPG)	-----	-----	-----	-----	5,938

[e] Estimate. [r] Revised. NA Not available.

TRADE

Total value of the 1963 metal and mineral exports was $35.7 million, of which phosphate and its products were the largest item, $25.5 million, constituting 20 percent of the value of total exports. Iron ore, lead, and cement also were among the 11 most valuable export commodities.

This pattern remained essentially unchanged in 1964. Exported phosphate and its products were valued at $25.6 million, 19.7 percent of total exports; iron ore ranked seventh among exports with a value of

$5.5 million; and lead and cement were, respectively, valued at $2.8 million and $1.3 million.

For the first 9 months of 1964, France took the largest quantity of phosphate exports with 435,350 tons. Next largest quantities went to Italy (364,631 tons), India (175,679 tons), and West Germany (153,108 tons).

In 1963, the United Kingdom took 41 percent of the iron ore exports, followed by Italy and the United Arab Republic (Egypt).

The value of major metal and mineral imports in 1963 was $39.7 million. Petroleum refinery products were valued at nearly $18 million. Rolled iron and steel products were the next most valuable imports, worth $14.5 million. France and Italy supplied most of the petroleum refinery products, and France supplied about 59 percent of the rolled products.

Total exports of Tunisia in 1964 were valued at $129.7 million, an increase of only 2.9 percent compared with that of 1963, while total imports were valued at $248.4 million, an increase of 11.4 percent.

TABLE 2.—Tunisia: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum:			
Crude	214	NA	
Scrap	100	(1)	
Copper:			
Scrap	864	517	Italy 379.
Semimanufactures	100	NA	
Iron and steel:			
Iron ore	713, 571	767, 899	West Germany 18,974; Italy 175,570; United Kingdom 313,370; Poland 99,629; United Arab Republic (Egypt) 99,654.
Scrap	18, 530	9, 983	Italy 9,212.
Rolled products	9	NA	
Lead:			
Crude	15, 233	13, 078	France 11,957.
Scrap	334	(1)	
Magnesium, crude and scrap	10	NA	
Precious metals, scrap...troy ounces	85, 857	NA	
Silver...do	17, 778	NA	
Tin, crude and scrap...long tons	2	NA	
Zinc:			
Ore	6, 760	7, 081	All to France.
Crude and scrap	17	(1)	
Metallic ash and residue	1, 212	NA	
Nonferrous scrap, unspecified [2]	----------	213	All to Italy.
Nonmetals:			
Cement	187, 781	84, 453	Italy 31,134; Spain 23,042; Libya 9,317.
Clays	11	NA	
Fertilizer materials:			
Phosphate rock...thousand tons	1, 877	2, 039	France 495; Italy 457; Yugoslavia 137; Czechoslovakia 98; India 150; Netherlands 79; Republic of South Africa 93.
Superphosphate	115, 089	147, 196	France 56,736; Greece 18,925; Turkey 15,075; Indonesia 14,785.
Gypsum	3, 771	NA	
Salt	130, 831	267, 430	Japan 60,522; United Kingdom 60,062.
Other, unspecified	2	810	Libya 793.
Mineral fuels:			
Coke	7	NA	
Petroleum, refinery products:			
Distillate fuel oil	r 14, 875	12, 865	Bunkers.
Residual fuel oil	r 9, 856	17, 366	Bunkers.
Lubricants	118	NA	

r Revised. NA Not available.

[1] Data on export of nonferrous metal scrap not reported separately by metal except for copper.

[2] Excludes copper.

In the overall foreign trade picture, France continued in 1964 as Tunisia's dominant trading partner. France took more than half of the country's exports ($67.2 million) and supplied 44 percent of the imports ($110.2 million). The United States ranked second among Tunisia's suppliers with $25.6 million worth of imports; this figure includes nearly $23 million financed under U.S. Government assistance programs.

TABLE 3.—Tunisia: Imports of major metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals: [1]			
Aluminum	262	387	France 192.
Copper	344	409	France 399.
Gold ... troy ounces	22,891	NA	
Iron and steel:			
Pig iron and ferroalloys	165	-----	
Scrap	125	NA	
Rolled products	71,199	76,724	France 44,904; United States 5,967 U.S.S.R. 5,337.
Lead	126	669	France 654.
Mercury ... 76-pound flasks	20	NA	
Nickel	6	NA	
Precious metals [2] ... troy ounces	3,633	NA	
Tin ... long tons	20	NA	
Zinc	162	NA	
Other, unspecified	38	NA	
Nonmetals:			
Abrasives, natural	43	NA	
Barite	2,197	NA	
Cement	6,120	8,158	France 6,863.
Chalk	90	NA	
Clay	2,536	[3] 6,511	France 3,172; West Germany 1,417.
Cryolite	60	NA	
Dolomite	169	NA	
Fertilizers:			
Nitrogenous	13,511	26,284	France 18,543; Italy 4,611; Bulgaria 2,729.
Others	-----	2,726	France 1,906.
Potassic	4,498	5,144	France 3,567.
Gypsum	295	NA	
Stone, building, including marble	4,260	1,051	Italy 1,038.
Pyrite	3,923	12,954	Spain 11, 954.
Salt	-----	NA	
Sulfur [4]	6,690	9,858	France 8,814.
Talc	666	NA	
Other and unspecified [5]	r 1,297	14,256	
Mineral fuels:			
Coal	27,485	28,639	U.S.S.R. 18,669; Poland 9,838.
Coal byproducts	9,267	8,890	West Germany 5,699.
Petroleum:			
Crude	6,591	NA	
Refinery products:			
Gasoline	76,291	77,198	France 45,493; Italy 13,507.
Kerosine	48,903	51,614	France 33,388; Italy 3,196.
Distillate fuel oil	150,725	161,218	France 79,258; Italy 16,388; U.S.S.R 6,863.
Residual fuel oil	210,669	240,051	Italy 107,937; U.S.S.R. 33,372; France 32,707; Venezuela 20,096; United Arab Republic (Egypt) 12,105.
Lubricants	9,008	11,172	France 10,430.
Liquefied petroleum gas (LPG)	5,654	6,907	France 5,847.
Others	16,325	14,872	Italy 14,031.

r Revised. NA Not available.

[1] Includes unalloyed and alloyed unwrought and semimanufactured forms.

[2] Excludes gold.

[3] Includes common bricks and refractory products.

[4] Excludes imports by principal superphosphate plant (47,350 tons in 1962).

[5] Includes small amounts of asbestos, borates, diatomite, flint, lime, mica, quartz, sand, and natural sodium carbonate.

COMMODITY REVIEW

METALS

Aluminum.—Alcoa International S.A. and the Tunisian Government announced the formation of a joint venture, Industries Maghrebines de l'Aluminum. The company, to be located in Tunis, will produce aluminum building materials.[6]

Iron Ore.—Iron ore production in 1964 increased nearly 9 percent over that of 1963, the same percentage increase as the year before. Production from the Djérissa mine was 716,000 tons (76 percent of the total) and that from the Tamera-Douaria mine was 223,300 tons. Nearly 945,000 tons was exported in 1964; chiefly to Italy, the United Kingdom, and Greece. Employees in the two mines in January 1965 were 1,260 at Djérissa and 650 at Tamera-Douaria.

Late in the year, the Tunisian Government and the Société de Djérissa discussed the possibility of the Government acquiring a major interest in the company. At yearend, no decision had been announced.

Iron and Steel.—Construction continued on the Société El Fouladh steel mill at Menzel Bourguiba near Bizerte. Work was on schedule and the plant was expected to open in mid-1965. Planned capacity was 70,000 tons of steel per year.

In October 1964, the Sidi Fath Allah foundry at Tunis (owned by the Société Nationale des Chemins de Fer Tunisiens SNCFT) started full operations. Under the general supervision of German technologists, the plant produced castings in steel, manganese steel, and gray iron for the Tunisian railways. Production in 1964 was 525 tons of cast iron and 120 tons of cast steel.[7]

Lead and Zinc.—Production of lead concentrate during the year was 20,648 tons, containing 13,421 tons of lead, a decrease of 5.8 percent compared with 1963 figures. The ore was smelted at the two plants, Fonderie de Mégrine (owned by Penarroya Co.) and Fonderie du Djebel Hallouf (owned by Société Anonyme du Djebel Hallouf); total metal production was 12,527 tons, including 1,066 tons of antimonial lead.

Exports of lead decreased 18 percent from those of 1963; in 1964 they were 9,554 tons of which France received 8,136 tons. The decreased output resulted from mining marginal veins, from operational difficulties, and from organizational problems resulting from the changeover from private to state ownership.

Production of zinc concentrate decreased from 7,936 tons in 1963 to 5,896 tons in 1964. Exports of zinc concentrates were 6,361 tons in 1964, nearly 19 percent less than in 1963. France received all of the zinc exports.

Employment in the five operating lead and zinc mines in January 1965 was 1,579; employment in individual mines was as follows: Djebel Semène—301; El Gréfa—198; Sidi Bou Aouane—430; Djebel Hallouf—451; and El Akhouat—199.

---

[6] International Commerce. V. 70, No. 50, Dec. 14, 1964, p. 2.

[7] U.S. Embassy, Tunis, Airgram A-882, May 7, 1965; Middle East Economic Digest, Apr. 2, 1965, p. 165.

Mercury.—The mercury mine at Djebel Arja, operated by the Société Minière du Djebel Arja, resumed operations in April 1964 and produced 87 76-pound flasks of metal by yearend.[8] Operations had been suspended since 1961. Mine employment at the end of the year was 48 workers.

NONMETALS

Phosphate.—Production of phosphate rock increased 16 percent over that of 1963. Exports in 1964 were 2,215,000 tons; of which France received 546,100 tons, Italy 471,800 tons, India 206,300 tons, and West Germany 199,300 tons. Three companies produced phosphate rock from five mines. Their estimated outputs in 1964 were: Compagnie des Phosphates et du Chemin de Fer Gafsa (GAFSA) (three mines)—1,858,800 tons; Compagnie Tunisienne des Phosphates du Djebel M'Dilla (CIPHOS)—538,200 tons; and Société Tunisienne d'Exploitation Phosphatière (STEPHOS)—353,900 tons.

Ore reserves, based on 1963 data, were estimated at about 102 million tons of 27 to 29 percent P_2O_5 concentrate.

Production of hyperphosphate, finely ground phosphate rock used directly as a fertilizer, increased greatly over that of 1963. Exports of hyperphosphates in 1964 totaled 111,569 tons, of which 93,800 tons went to South Viet-Nam.

Domestic consumption of phosphate in 1964 was estimated at 311,000 tons, most of which was used by the Société Industrielle d'Acide Phosphorique et d'Engrais (SIAPE) in the manufacture of triple superphosphate; during the year this company produced an estimated 152,270 tons of superphosphate. It exported 124,800 tons, mostly to France (60,300 tons), Greece (25,000 tons), and Algeria (9,900 tons).

Total employment in the phosphate industry was 8,867 in January 1965. These incldued 8,479 employed by the three mining companies (GAFSA—5,588; CIPHOS—2,292; and STEPHOS—599) and 388 employed by SIAPE.

In September 1964, representatives of Tunisia, Morocco, and Jordan announced in Amman, Jordan, the formation of a phosphate production and sales association, Office des Producteurs de Phosphate, to coordinate marketing of the phosphates of the three countries.[9] At an earlier conference of these representatives, it was announced that the sales price of natural phosphate would be increased by $1.00 to $1.25 per ton.

MINERAL FUELS

Coal.—Total imports of solid fuels (coal, coke, and briquets) in 1964 were 42,970 tons and consumption was 40,000 tons. Lime and cement factories consumed 7,428 tons, foundries 4,524 tons, and railroads 1,968 tons.

Petroleum.—In December 1963, Tunisia's first petroleum refinery went on stream. Built at Zarzouna, east of Bizerte, by an affiliate of Ente Nazionale Idrocarburi (ENI), the Italian state-owned oil company, the plant had an annual capacity of 1 million tons of crude oil.

---

[8] Middle East Economic Digest. Apr. 2, 1965, p. 165.
[9] Africa Report. V. 9, No. 10, November 1964, p. 27.

The refinery was owned by Société Tuniso-Italienne de Raffinage (STIR) which in turn was owned 50 percent by the Tunisian Government and 50 percent by ENI.

The refinery was designed to process imported light crude oils; no data were available as to the sources and quantities of crude oil imported and processed during 1964. Output of the refinery totaled 570,800 tons of products, which exceeded the 1963 level of refined petroleum product imports; apparent domestic demand, however, rose to the point where imports of petroleum products in 1964 were 562,400 tons.[10]

Early in 1964, the Société Italo-Tunisienne d'Exploitation Pètroliére (SITEP) discovered an apparently commercial oilfield at El Borma, in southern Tunisia. The field is along a poorly defined section of the Tunisian-Algerian border and it appears that Algeria will claim half of the field. It was estimated that the field would be in production by 1966, when output would be about 1 million tons per year; oil reserves were estimated at 12 to 15 million tons.

A show of gas was reported in a well drilled about 60 kilometers west of Sfax by Rimrock Petroleum Corporation, a consortium of six independent American oil companies including Rimrock-Tidelands Inc., Colorado Oil and Gas Co., Signal Oil and Gas Co., and Husky Oil Co. of Canada. The well was not commercial.

On June 5, 1964, it was reported that the Tunisian Government had signed agreements with French oil companies for exploration both on the mainland and on the Continental Shelf east of the coast. One permit was signed with Société de Participation Pétrolière (PETROPAR) covering an area in the Gulf of Hammamet and another was signed with Société Nationale des Pétroles d'Aquitaine (SNPA) covering the Gulf of Gabes. Minimum expenditures under the two permits are $4.8 million (DT 2 million). A third area covering a large part of north-central Tunisia was covered in a permit signed with Société de Recherches et d'Exploitation des Pétroles en Tunisie (SEREPT) and SNPA; expenditures under this permit are to be $3.6 million (DT 1.5 million).

SOURCE MATERIAL

Sources of statistical data used in this chapter included the "Bulletin Mensuel de Statistique, Nouvelle Série," published by the Sécrétariat d'État au Plan et à l'Économie Nationale, and the "Documents Statistiques Mensuelles Concernant l'Activité Minière en Tunisie," by Division des Mines, Énergie, et Production Industrielle. Other data, particularly trade data for 1963, came from "Commodity Trade Statistics 1963" (series D, v. XIII, No. 25, pp. 4985–5002), by the United Nations.

The U.S. Embassy, Tunis, supplied chronological and background data.

---

[10] Bulletin Mensuel de Statistique. New ser., March 1965, No. 123, p. 8.

The Mineral Industry of the United Arab Republic (Egypt)

By William C. Henkes[1]

⁂

THE petroleum industry of the United Arab Republic (Egypt) continued to be the only sector of the mineral industry to make a significant contribution to the country's overall economy, providing better than 90 percent of total mineral industry production value. Total output value for 1964 was not available in time for inclusion in this chapter but presumably exceeded the 1963 total of $287.2 million[2] (£E100 million), which may be compared with the 1962 total of $258.5 million (£E90 million). The gross national product in 1963 was $3,900 million (in 1963 prices), an increase of 15.7 percent compared with 1962 figures.[3]

In attempting to attain self-sufficiency and thereby reduce the chronic foreign trade deficit, the United Arab Republic (U.A.R.) continued to develop facilities to provide greater productive capacity. A 13-percent increase in petroleum output and gains in production of several less important commodities resulted. However, production of the U.A.R.'s other two principal mineral products, phosphate rock and salt, declined appreciably in 1964.

Average employment in the U.A.R.'s extractive industries in mid-1963 was 16,168 out of a total industrial labor force of 384,490.[4]

GOVERNMENT POLICIES AND PROGRAMS

The Government continued its policy of nationalizing industry; late in March, the Shell-Egypt Marketing Company and other Shell and British Petroleum Co. Ltd. interests were nationalized. At yearend, no agreement had been reached on compensation for these interests.

Several trade agreements were made with various countries; among them were Poland, Tanzania, Uganda, Republic of the Congo (Léopoldville), Togo, Mauritania, and Kuwait. Trade agreements made previously with the U.S.S.R., Hungary, Czechoslovakia, Rumania, and Yugoslavia were implemented.[5]

---

[1] Petroleum engineer, Division of International Activities.

[2] Where necessary, values have been converted from Egyptian pounds (£E) to U.S. dollars at the rate of £E1=US$2.872.

[3] Federation of Industries in the U.A.R., Yearbook 1964, p. 1–24.

[4] National Bank of Egypt. Econ. Bull. v. 17, No. 3, 1964, pp. 389, 387.

[5] National Bank of Egypt. Econ. Bull. v. 17, No. 4, 1964, pp. 434–438.

PRODUCTION

The trends in mineral production showed no drastic changes. Production of chromite, gold, and tungsten ore had virtually ceased; however, outputs of petroleum, kaolin, diatomite, talc, and vermiculite showed very large increases. These increases probably reflected the expanding overall industrial activity of the country.

TABLE 1.—United Arab Republic (Egypt): Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Chromite	300	1,390	--------	--------	--------
Gold ... troy ounces	1,214	931	NA	NA	--------
Iron and steel:					
Iron ore	241,000	422,145	[r] 460,992	480,948	447,213
Pig iron	148,000	173,597	203,956	204,706	NA
Steel nigots and castings	[r] 138,169	[r] 158,193	[r] 189,711	[r] 196,807	NA
Rolled shapes and plates	NA	67,412	77,608	83,009	101,411
Lead, metal content of ore	80	35	540	[e] 500	--------
Manganese ore:					
With more than 35 percent Mn [1]	20,000	[r] 17,097	38,625	[r] 26,067	NA
With 35 percent or less Mn	256,000	[r] 261,350	147,057	[r] 145,760	NA
Total	276,000	278,447	185,682	171,827	[2] 328,011
Titanium minerals:					
Ilmenite	12,000	[r] 43,069	44,643	541	21
Rutile	[e] 1,000	--------	[r] 91	4	--------
Tungsten ore, 60 percent WO_3 basis	--------	[e] 83	--------	--------	--------
Zirconium ore	370	[r] 95	171	[r] 36	NA
Nonmetals:					
Asbestos	[r] 435	230	550	[r] 500	1,578
Barite	[r] 2,720	1,573	1,230	4,123	4,551
Cement:					
Portland ... thousand tons	1,903	1,750	[r] 1,693	1,723	2,384
Other ... do	144	309	[r] 539	805	
Diatomite	[r] 617	301	50	831	39,989
Feldspar	[r] 500	--------	--------	--------	4,728
Gypsum	[r] 484,890	462,350	467,570	453,718	337,450
Kaolin	[r] 22,434	27,180	[r] 14,601	[r] 24,043	62,796
Phosphate rock	[r] 565,583	626,530	601,747	[r] 644,423	613,237
Salt	522,390	517,220	560,176	[r] 715,305	674,555
Sulfur, elemental:					
From sulfur ore	[r] 20,905	[r] 45,409	31,051	4,750	NA
Other	2,407	2,586	2,072	2,393	2,466
Talc	[r] 4,891	5,956	6,126	[r] 7,131	16,821
Vermiculite and mica	[r] 110	[r] 77	284	30	416
Mineral fuels:					
Coke, low temperature [e] ... thousand tons	30	30	35	35	35
Petroleum:					
Crude ... thousand 42-gallon barrels	22,703	26,136	32,320	38,759	43,915
Refinery products:					
Gasoline	306,400	386,483	552,517	713,692	756,766
Kerosine and jet fuel	370,100	481,821	592,215	[r] 846,336	983,670
Distillate fuel oil	587,600	717,795	894,887	1,037,815	[3] 199,312
Residual fuel oil	2,733,600	2,650,900	2,822,615	3,392,241	NA
Asphalt	111,800	123,700	152,803	[r] 147,887	150,775
Liquid petroleum gas	20,200	25,288	31,313	39,225	NA
Total	4,129,700	4,385,987	5,046,350	6,177,196	NA

[e] Estimate. [r] Revised. NA Not available.

[1] Includes annually about 5,000 tons of MnO_2.

[2] It is estimated that of this amount, 268,970 tons were ore with 35 percent or less Mn.

[3] As reported; subject to revision.

TRADE

Latest trade data available for the U.A.R. are contained in publications of the National Bank of Egypt and the Federation of Industries in the U.A.R., but these data do not show sources and destinations of commodities in detail.

In 1963, total exports of the country were valued at $649 million (£E226 million), an increase of 44 percent compared with 1962 figures. Exports of principal minerals (table 2) were valued at $77.3 million (£E26.9 million), an increase of 28 percent over those of 1962. Of this total, crude oil exports valued at $42.2 million were the largest single item. Residual fuel oil and gasoline were the next most valuable mineral exports at $12.9 million and $6.9 million, respectively, followed by phosphate rock worth $4.9 million.

Total imports for 1963 were valued at $1,144 million (£E398.4 million), an increase of 32 percent over those of 1962. The trade deficit for 1963, therefore, was $494 million (£E172 million), as compared with $414 million in 1962; although the 1963 deficit exceeded that of 1962 by $80 million, the growth rate of the deficit declined markedly for the second time since 1960. Total value of the principal metal and mineral imports (table 3) was $204.8 million (£E71.3 million) for 1963 and $261.1 million (£E90.9 million) for 1962. Here again, crude petroleum was the largest single item in terms of value—$78.4 million (£E27.3 million) in 1963. Iron and steel products were next in value at $56.6 million (£E19.7 million).

The United States was the largest supplier of U.A.R. imports in 1963, with commodities totaling $312.8 million (£E108.9 million). East Germany and the United Kingdom were next with $115.5 million (£E40.2 million) and $100.8 million (£E35.1 million), respectively. The U.S.S.R. supplied imports valued at $62.2 million (£E21.3 million).

The largest buyer of exports was the U.S.S.R. with $126.9 million (£E44.2 million), followed by Czechoslovakia with $63.5 million (£E22.1 million) and Italy with $50.8 million (£E17.7 million). Purchases by the United States amounted to $28.1 million (£E9.8 million).

For the first 6 months of 1964, preliminary data[6] indicated that the United States had retained its position as the leading supplier of U.A.R. imports: $179.8 million (£E62.6 million) worth or an annual rate of $359.6 million. West Germany provided $64.9 million worth of imports. The U.S.S.R. took the largest amount of exports, $61.2 million (£E21.3 million) worth, during this period.

The same data show that mineral imports during the first half of 1964 were worth $74.4 million (£E25.9 million) and exports were worth $36.7 million (£E12.8 million).

---

[6] Work cited in footnote 5, pp. 468–479.

TABLE 2.—United Arab Republic (Egypt): Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Manganese ore	[r] 159,616	122,769	Italy 31,215; Belgium 30,160; Czechoslovakia 23,461; Netherlands 12,370.
Nonmetals:			
Cement:			
Portland	[r] 443,842	194,387	Saudi Arabia 48,050; Gaza 41,096; Aden 22,885; Libya 20,230.
Other	14,384	25,061	Kuwait 10,500; Lebanon 5,400; Iraq 2,700; Saudi Arabia 2,250.
Fertilizer materials:			
Phosphate rock	180,082	420,192	Yugoslavia [e] 221,623; Czechoslovakia 71,865; Cylon 58,368; Japan [e] 30,626.
Phosphatic	28,000	35,000	Yugoslavia 19,500; Chile 7,000; Italy 2,850.
Gypsum	54,632	51,845	Japan 44,823; Saudi Arabia 6,000.
Salt	[r] 208,842	162,699	Japan 131,403; Yugoslavia 10,000; Syria 9,717; United States 9,716.
Talc	1,479	1,120	East Germany 790; Switzerland; 170; United Kingdom 130.
Mineral fuels:			
Petroleum:			
Crude ....thousand tons	[r] 2,928	3,419	Italy [e] 2,428; United States [e] 259; Netherlands [e] 38.
Refinery products: [r]			
Gasoline	252,268	296,711	NA.
Kerosine and jet fuel	4,000	4,000	NA.
Distillate fuel	20,429	46,344	NA.
Residual fuel	401,534	965,080	NA.
Asphalt	11,852	12,582	NA.
Liquid petroleum gas (LPG)	----------	1,407	Lebanon 918; Cyprus 470; Libya 19.

[e] Estimate. [r] Revised. NA Not available.

TABLE 3.—United Arab Republic (Egypt): Imports of selected metals and minerals[1]

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:[2]		
Aluminum	3,334	4,893
Copper	[r] 6,587	10,294
Iron and steel:		
Iron pyrite, roasted	14,802	61
Scrap	26,665	51,780
Pig iron and ferroalloys	127,932	55,049
Semimanufactures:[r]		
Bars and shapes	125,672	104,627
Plates, sheets, and strips	86,721	87,964
Rails and accessories	29,793	5,075
Pipes and fittings	40,270	45,442
Lead	6,089	5,325
Tin long tons	544	442
Zinc	2,122	2,450
Nonmetals:		
Asbestos	9,553	746
Brick, refractory	5,742	10,446
Dolomite and magnesite	4,624	4,661
Fertilizers:		
Nitrogenous	297,372	351.330
Phosphatic	73,920	58,049
Unspecified	108,960	NA
Kaolin	8,634	10,337
Pyrite, unroasted	18,696	161,601
Stone, building	3,196	6,896
Sulfur	8,509	124
Mineral fuels:		
Coal and coke	[r] 296,558	297,200
Petroleum:		
Crude thousand tons	3,401	4,323
Refinery products:		
Gasoline	5,618	23,520
Kerosine	[r] 317,953	141,000
Fuel oil (distillate and residual)	260,000	176,000
Lubricants	35,440	66,548
Wax	2,313	2,237

[r] Revised. NA Not available.

[1] Sources of imports are generally not available for 1963; in the case of crude petroleum, however, the sources are estimated as: Saudi Arabia 1,182,000 tons; U.S.S.R. 1,078,000 tons; and Kuwait 930,000 tons.

[2] Includes unwrought, semimanufactures, and scrap.

COMMODITY REVIEW

METALS

Aluminum.—At yearend, the United Arab Republic (Egypt) announced the signing of a contract providing for the construction of an aluminum reduction plant at Aswan with Centrozap, the Polish foreign trade organization dealing with mining and metallurgical equipment. The plant, to cost an estimated $19 million, was to have an annual capacity of 40,000 tons of aluminum. Financing will be by means of a Polish loan at 2.5 percent, repayable in 10 annual installments.

Iron and Steel.—Output of the integrated steel plant at Helwan, 17 kilometers south of Cairo, probably increased slightly from the level of 1963 when output of Thomas converters and electric furnaces was 157,031 tons and 37,148 tons of steel, respectively. Overall output of rolled products in 1964 was 101,411 tons, as compared with 83,009 tons the previous year and 77,608 tons in 1962.

Plans continued for exploiting iron ore deposits at Bahariya Oasis, where reserves of between 100 and 250 million tons of ore, averaging

47.9 percent iron are indicated. Ore will be fed to two furnaces at Helwan which heretofore operated on ore from Aswan. Bids were requested on construction of a railroad from the deposits to Helwan but, at yearend, no results had been announced.

The project of the Sinai Manganese Co. to electrically reduce Sinai manganese ore to ferromanganese gained new impetus as a result of approval of a contract with Westinghouse Electric Corp. for installation of a generator at Abou Zeneima.[7] The ferromanganese project reportedly will cost $21.7 million (£E7.57 million) and produce annually 27,000 tons of pig iron and 10,000 tons of ferromanganese.

In July, the Nasr Forging Co. plant was inaugurated. Built with Soviet aid, it will use iron and steel products from the nearby Helwan steel mill; it is expected to produce about 20,000 tons per year of crankshafts, axles, propeller shafts, rock bits, and similar products.

NONMETALS

Cement.—As part of the Government's plan to increase cement production capacity to 4 million tons per year by 1970, an agreement was made in February with Société Sive Lille Compagnie of France for construction of two 1,700-ton-per-day cement kilns, one each at the Tura and Helwan cement plants. Estimated cost of the two furnaces is $5.7 million (£E2 million).

Fertilizers.—In May 1964, two West German companies, Badische Anilin und Soda Fabrik A.G. and Friedrich Uhde G.m.b.H., agreed to supply and install about $18.4 million worth of equipment to enlarge the El Nasr Company for Fertilizers and Chemical Industries at Attaka. The expansion was expected to increase total production capacity of calcium nitrate and ammonium sulphate to 875,000 tons per year.

Salt.—The United Arab Republic (Egypt) and the Yemen Arab Republic jointly formed a salt company capitalized at $2.3 million (£E800,000). The company planned to exploit the rock salt deposits near Salif on the northern Yemeni coast. Ownership was to be 51 percent Yemeni and 49 percent Egyptian with company headquarters in Hodeida, about 75 kilometers south of Salif.

Sulfur.—It was reported at midyear that a geological survey team had discovered sulfur ores in the Marazi and Khamsia Hills of the Magaaz area near the Siwa Oasis (Western Desert). The survey was continued to determine the extent of the deposits.[8]

At the Suez refinery of Al Nasr Oil Refinery and Petrochemical Products Co. (formerly the "Government Refinery"), an absorption system was designed for removing hydrogen sulfide gas from the natural gas associated with Egyptian crude oil. The plant was designed by the French associate of Lummus Company, New York, the Société Française des Techniques Lummus, to handle natural gas containing 8.9 percent by volume of H_2S and yield sweet gas with less than 50 grains sulfur per thousand standard cubic feet. Sulfur capacity of the plant reportedly will be 5,000 tons per year.[9]

---

[7] Engineering and Mining Journal. V. 166, No. 2, February 1965, p. 148.
[8] Sulphur. No. 54, October 1964, p. 5.
[9] Sulphur. No. 51, April 1964, p. 18.

MINERAL FUELS

Coal.—The first U.A.R. coal mine was inaugurated on July 16 at El Meghara on the Sinai Peninsula. Reserves at the mine are reportedly between 10 million and 40 million tons. Depth to the coal seams is about 1,300 feet, and the seams average about 6 feet in thickness.[10] The U.A.R. Government established a company, capitalized at $8.6 million (£E3 million), to operate the mine. Coal will be supplied to both the Ministry of Electric Power and the Helwan coking plant; output of the mine was planned to be 620,000 tons annually by 1970. The coal was reported to have poor coking characteristics, and it will be necessary to mix the Meghara product with imported coking coal. At yearend, no road or rail facilities were available to the mine site.

Coke.—In December 1963, the furnace of the U.A.R.'s first coke plant was ignited preparatory to commencing operations in early 1964. The plant, financed by Soviet loans and costing approximately $31.6 million (£E11 million), is adjacent to the Helwan steel mill and reportedly had a capacity of 280,000 tons of coke annually. Some 140 million cubic meters of gas will be produced annually and used for fertilizers. Other byproducts will be used to manufacture pharmaceuticals, plastics, and insecticides. Production cost of the coke is estimated at $40.21 per ton, as compared with $31.59 per ton for imported coke. The new plant, however, will provide employment for 600 Egyptians and in addition will reduce the foreign exchange deficit.

Petroleum.—The U.A.R.'s goal of becoming self-sufficient in petroleum or of becoming a net exporter of petroleum came closer to realization during 1964. Crude oil production increased 13.3 percent over that of 1963 to 43.9 million barrels in 1964. This production was from 13 separate fields. Although nine of the fields showed slight to appreciable decreases in production, the losses were more than compensated for by the rapid development of the Bala'eim (Marine) field during the year; this field more than doubled its 1963 production.

TABLE 4.—United Arab Republic (Egypt): Petroleum, production and reserves by fields, 1963–64

(In 42-gallon barrels)

Oilfield	Gravity (° API)	Production		Reserves Jan. 1, 1964
		1963	1964	
Abu Radees	24.4	697,935	646,849	14,020,000
Akma	19.1	138,621	152,162	1,932,000
Assal	22	772,262	678,103	4,756,000
Bakr	17	2.940,110	3,945,975	59,639,000
Bala'eim (marine)	29	6,070,714	14,117,494	127,495,000
Bala'eim (land)	21	21,246,781	18,327,932	289,241,000
Feeran	25	199.160	187,889	146,000
Harghada	23	157,843	147,269	2,254,000
Karim	20	704,602	794,987	4,402,000
Matarma	22	104,996	100,341	558,000
Ras Ghareb	25	4,205,838	3,372,000	32,243,000
Ras Sidr	22	978,605	914,411	7,665,000
Sidri	24.7	541,728	529,677	(1)
Total		38,759,195	43,915,089	544,351,000

[1] Included with Abu Radees.

---

[10] Mining Journal (London). V. 264, No. 6753, Jan. 22, 1965, p. 61.

On the basis of figures for the first half of the year, crude oil processed by domestic refineries increased 25 percent over the same period of 1963. To meet the increased capacity of the refineries, imports of crude oil increased about 7.5 percent.[11]

Exploration.—Late in 1963, the U.A.R. completed concession agreements with three foreign petroleum companies: Ente Nazionale Idrocarburi (ENI), the Italian state-owned company; Phillips Petroleum Company; and Pan American UAR Oil Company. In early 1964, Pan American also acquired a concession covering about 70 percent of the offshore area of the Gulf of Suez.

The ENI concession, operated by Campagnie Orientale des Pétroles d'Egypte (COPE) which was jointly owned by ENI and the Egyptian General Petroleum Corporation, covered nearly 28,000 square kilometers on the Nile Delta from the Rosetta mouth eastward to the Suez Canal.

The Phillips concession was divided into three areas, Burg el Arab, Mersa Matruh, and Faghur, totaling 96,000 square kilometers along the coast from the Rosetta mouth of the Nile westward to the Libyan border and north of latitude 30°. Three seismograph crews were surveying these areas during 1964.

Pan American's Western Desert concession was south of Phillip's two eastern blocks and totals about 73,000 square kilometers. The company conducted seismic, photogeologic, and surface geologic work in the area during the year. This company drilled one dry hole in its Gulf of Suez block from the floating drilling barge "Discoverer" and, at yearend, was drilling a second well.

COPE discovered a new field in 1964 at Garah in the Gulf of Suez about 50 miles south of the Bala'eim field. The discovery well, drilled to 10,735 feet, tested 2,500 barrels of 31° API oil per day from a zone at 7,218 feet.[12]

In the Bala'eim offshore field, a significant test drilled by COPE yielded 8,490 barrels of oil per day from three producing zones; the oil ranged in gravity from 31.5° to 33.4° API.

At yearend, the Egyptian press noted that foreign oil companies (Phillips, Pan American, and ENI) had spent over $5 million for exploration in the Western Desert, the Delta, and the Gulf of Suez.

Refining.—The most significant development in petroleum in the U.A.R. in 1964 was the expansion of refining capacity. At the Al Nasr Oil Refinery and Petrochemical Products Company at Suez, an Italian-built petroleum coking plant was opened; annual consumption will be 1.5 million tons of fuel oil to produce 35 percent coke in addition to kerosine and distillate. The coke goes to a new 100-megawatt powerplant which was scheduled for completion at yearend.

Also at this refinery, a Czechoslovakian-built combination vacuum and atmospheric distillation unit costing approximately $5.7 million was completed; its throughput capacity is reportedly 1 million tons of crude oil per year. The U.S.S.R. constructed a lubricating oil plant of 65,000-ton-per-year capacity at the Al Nasr refinery at a cost of $17.2 million.

---

[11] U.S. Embassy, Cairo, U.A.R. (Egypt). Airgram, A–483, Jan. 9, 1965.
[12] Petroleum Press Service. V. 31, No. 11, November 1964, p. 434.

Transportation, Suez Canal.—Early in the year, the U.A.R. Government announced that Suez Canal tolls would be raised 1 to 6 percent. The 1 percent increase applied to all ships and the higher rate increases apply to ships having drafts over 37 feet and beams over 104 feet. Almost concurrently, a loan agreement between Kuwait and the U.A.R. was announced which made available $28 million for deepening the canal from a maximum draft of 38 feet to 41 feet within 2 years in order to accomodate large tankers.

During 1964, over 70 percent of all tonnage moving through the canal was petroleum. Of the 19,943 ships traversing the canal, 9,765 were tankers; of the 210,981,000 tons of cargo, 150,797,000 tons consisted of petroleum. Most of the petroleum, 144,661,000 tons, was northbound with Italy (31,379,000 tons) and the United Kingdom (29,381,000 tons) the principal destinations; chief sources of the petroleum were Kuwait and the Neutral Zone (64,668,000 tons), Iran (33,251,000 tons), and Saudi Arabia (22,763,000 tons). Crude oil amounted to 132,685,000 tons of this northbound petroleum.

Southbound petroleum totaled only 6,136,000 tons, mostly from the U.S.S.R. (4,767,000 tons) and Rumania (665,000 tons).

SOURCE MATERIAL

Official trade statistics were published in the "Monthly Summary of Foreign Trade," by the Department of Statistics and Census, Cairo; for some commodities, the destinations and sources are indicated. More recent data were obtained from the "Federation of Industries in the U.A.R. Yearbook, 1964." Other sources were the "Economic Bulletin" published by the National Bank of Egypt and "Economic Review of the Central Bank of Egypt." The U.S. Embassy, Cairo, and the various U.S. consulates were important sources of information.

The Mineral Industry of Other Areas of Africa

By Charles L. Kimbell[1][2]

Contents

	Page
Burundi	979
Cameroon	980
Central African Republic	984
Chad	988
Congo, Republic of (Brazzaville)	991
Dahomey	997
French Somaliland	999
Gambia	999
Mali	999
Mauritania	1001
Niger	1005
Rwanda	1009
Somali Republic	1011
Togo	1014
Upper Volta	1017

OF THE 15 countries and territories covered by this chapter, all but Gambia are overseas associates of the European Economic Community (EEC).[3] In an effort to provide more uniform, complete, and up-to-date statistical coverage, EEC sources have been used to a considerable extent in preparation of trade tables in this chapter rather than official sources of the respective governments. For this reason, data furnished differs somewhat in form and depth of coverage from that furnished in the 1963 edition of the Minerals Yearbook, Volume IV, Area Reports: International.

BURUNDI

The Kingdom of Burundi, with no mineral operations of world significance, remained an inconsequential producer of columbium-tantalum concentrate and tin concentrate in 1964.

Details on mineral operations in the Kingdom are not available for 1964, and generally have been confined to incomplete production statistics in previous years. Barring a radical unreported increase in output in 1964, the small mining operations in Burundi made no significant contribution to the nation's economy, the value of output in 1963 being $54,000 to $60,000, based on the official conversion rate of about 50 Burundi francs equal to US$1.00.

---

[1] Physical scientist, Division of International Activities.

[2] Except the section on the Republic of Congo (Brazzaville), which was written by Benjamin H. Lim.

[3] Other African Continent associates, covered in separate chapters, are Algeria, Republic of the Congo (Léopoldville), Gabon, Ivory Coast, Malagasy, and Senegal.

TABLE 1.—Burundi: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1960	1961	1962	1963
Metals:				
Columbium-tantalum concentrate	(2)	(2)	2	2
Tin:				
Cassiterite concentrate ... long tons	(2)	(2)	35	25
Content of concentrate ... do	(2)	(2)	r 26	r 16
Nonmetals: Limestone	NA	NA	NA	360

r Revised. NA Not available.

[1] In addition, construction materials such as clay, sand, and gravel are produced, but no quantitative data are available.

[2] Production, if any, included with that of Rwanda.

CAMEROON

Production of aluminum from imported alumina remained the only important mineral industry activity in the Federal Republic of Cameroon through 1964. Output was at a slightly lower level than in 1963, and the Republic, Africa's only producer of primary aluminum, supplied only about 0.8 percent of total estimated world output, compared with almost 1.0 percent in 1963.

The gross national product of Cameroon was estimated at about $425 million,[4] based on the 1963 figure of $400 million (at current prices); mineral output value in 1964 was estimated at $22.1 million (excluding the value of simple construction materials), compared with $22.8 million in 1963.

PRODUCTION AND TRADE

Official mineral production data for Cameroon were not available for 1964; recorded aluminum output is from unofficial sources; estimates of gold and tin production simply indicate an order of magnitude.

TABLE 2.—Cameroon: Production of metals and minerals

Commodity [1]	1960	1961	1962	1963	1964
Metals:					
Aluminum ... metric tons	43,940	47,578	52,250	r 52,913	51,559
Gold ... troy ounces	416	537	775	1,874	e 1,000
Tin, content of concentrate ... long tons	65	65	23	30	e 30
Nonmetals:					
Kyanite ... metric tons	5	----------	----------	----------	----------

e Estimate. r Revised.

[1] In addition, construction materials such as clay, sand, and gravel are produced, but no quantitative data are available.

---

[4] Where necessary, values have been converted from African Financial Community francs (CFAF) at the rate of CFAF245 equal to US$1.00.

Official Cameroon Government data on foreign trade for 1964 also were not available; in 1963, the country's overall trade balance improved, giving a net earning of nearly $7.6 million more than in 1962, in spite of a negative balance for mineral commodities in 1963. Total export value increased by 15 percent in 1963, while total import value rose only 7 percent. In contrast, mineral commodity exports increased only 3 percent in 1963, while mineral commodity imports increased 29 percent as a result of quantitative increases for virtually all mineral commodities recorded. Details on trade value for 1962 and 1963 were as follows:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total	
Exports:			
1962	21,922	103,212	21.2
1963	22,594	118,334	19.1
Imports:			
1962	20,030	101,453	19.7
1963	25,807	108,989	23.7
Net trade balance:			
1962	+1,892	+1,759	XX
1963	−3,213	+9,345	XX

XX Not applicable.

Ingot aluminum was by far the most important mineral export; shipments were valued at $22.2 million and accounted for 98 percent of the total mineral commodity export value in 1963, $719,000 more than in 1962, but virtually unchanged on a percentage basis from exports of that year. Distribution of mineral import values by major commodities and commodity groups were as follows:

	Share of mineral imports (percent)	
Import group:	*1962*	*1963*
Alumina	30	35
Iron and steel	15	19
Cement, lime and dimension stone	7	6
Petroleum refinery products	34	27

France was again Cameroon's leading trading partner with regard to total trade and mineral trade, both imports and exports.

TABLE 3.—Cameroon: Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals: [1]			
Aluminum:			
Ingot, unalloyed	50,929	52,285	France 47,733; United States 2,891; United Arab Republic (Egypt) 1,524.
Other forms	4	174	Rep. of Congo (Brazzaville) 64; Gabon 44; Central African Republic 33; Chad 29.
Copper	1	2	Mainly to Chad.
Iron and steel:			
Scrap	4,848	2,502	Japan 2,500.
Pig iron	--------	260	All to Italy.
Steel ingots	--------	3	All to Chad.
Semimanufactures	160	52	Chad 25; Gabon 14; Central African Republic 8.
Lead	93	68	Italy 57; Denmark 10.
Tin ore and concentrate ....long tons	123	37	All to Netherlands.
Titanium concentrate (ilmenite)	10	NA	
Other nonferrous ores and concentrates, not further described.	163	159	France 106; West Germany 28; Italy 25.
Nonmetals:			
Cement, lime, and dimension stone [2]	171	47	Central African Republic 22; Nigeria 14.
Miscellaneous crude nonmetallic minerals [2]	66	78	Nigeria 69.
Nonmetallic mineral manufactures [2]	([3])	383	All to Gabon.
Mineral fuels:			
Gas, natural or manufactured	7	--------	
Petroleum refinery products	147	32	Gabon 12; Rep. of Congo (Brazzaville) 7.

NA Not available.

[1] Unless otherwise specified, items exclude ores, concentrates, and scrap, but include all other unalloyed and alloyed unwrought and semimanufactured materials.

[2] For details on specific commodities included, see section of text on source materials.

[3] Less than ½ unit.

TABLE 4.—Cameroon: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	r 1962	1963	Principal sources, 1963
Metals: [1]			
Aluminum:			
Alumina	84,681	124,995	Guinea 114,745; Spanish Guinea 5,150; Mali 5,100.
Metal, all forms	1,004	1,487	France 1,486.
Copper	44	66	All from France.
Iron and steel:			
Pig iron and ferroalloys	168	138	All from France.
Steel ingots and equivalent forms	60	----------	
Semimanufactures:			
Bars, rods, and sections	7,215	9,667	France 8,170; Belgium-Luxembourg 867.
Plates and sheets	5,760	8,422	France 8,168.
Other	2,916	7,821	France 7,550; West Germany 169.
Total	15,891	25,910	
Lead	34	56	France 38; Netherlands 10.
Nickel	----------	33	All from Belgium-Luxembourg.
Tin	2	2	All from France.
Zinc	7	14	All from France.
Nonmetals:			
Abrasives, natural [2]	56	87	France 86.
Cement, lime, and dimension stone [2]	68,015	74,417	France 50,396; Belgium-Luxembourg 20,983.
Clay construction materials [2]	1,299	1,306	France 1,233; West Germany 69.
Fertilizer materials, processed	13,300	14,249	France 11,750.
Stone, sand, and gravel [2]	127	124	All from France.
Miscellaneous crude nonmetallic minerals.	13,100	11,897	West Germany 4,478; Senegal 3,482; Portugal 2,311.
Nonmetallic mineral manufactures [2]	71	122	France 113.
Mineral fuels:			
Coal, coke and briquets	312	476	All from France.
Gas, natural or manufactured	622	623	France 618; Senegal 5.
Petroleum:			
Crude and partly refined	----------	5	All from France.
Refinery products	146,966	150,946	Netherlands Antilles 46,983; Venezuela 37,666; West Germany 28,703.

r Revised.

[1] Unless otherwise specified, items exclude ores, concentrates, and scrap, but include all other unalloyed and alloyed unwrought and semimanufactured materials.

[2] For details on specific commodities included, see section of text on source materials.

COMMODITY REVIEW

Metals.—*Aluminum.*—The small decline in aluminum production by Compagnie Camerounaise d'Aluminium Pechiney—Ugine (ALUMCAM) at its plant in Edéa was reportedly due to lower energy availability from the Edéa dam. This decline was attributed to uneven level of flow of the Sanaga River during the dry season. This problem was to be alleviated by the construction of an earthen dam above the existing Edéa dam hydropower plant; this new dam would regulate water flow to the generator plant.

Plans were announced for the erection of a mill at Edéa to roll aluminum ingots produced by ALUMCAM into sheets to supply the corrugating plant that has been in operation there since 1962 using imported coils.

No developments were reported toward the economic utilization of Cameroon's extensive bauxite resources on the Adamaoua plateau and in the border area between east and west Cameroon. Inadequate transportation has precluded economic development.

Gold.—Although details on gold mining activities in 1964 were not available, it is presumed that output continued to come mainly from the tributer operations in the Compagnie Minière du Cameroon license area in the Betare-Oya area.

Iron Ore.—No details are available on reportedly sizable iron ore deposits in the southwestern coastal area of the Republic.

Tin.—Société de Fibre et Mécanique of Douala continued to operate the Mayo Darle tin mine, the Republic's only tin mine, through 1964.

Nonmetals.—*Cement.*—Progress, if any, on two cement plants, plans for construction of which were announced in September of 1963, was unreported in 1964. Total announced planned annual capacity was 105,000 tons.

Diamond.—Occurrences of diamond have been reported in the past, but production, if any, has never been recorded exactly, and details on the nature of deposits are not available.

Mineral Fuels.—*Petroleum.*—Société de Recherches et d'Exploitation des Pétroles au Cameroon (SEREPCA), of which the Cameroon Government holds 10.7 percent interest, was granted two offshore concessions in May 1964. These concessions, covering an initial period of 4 years, were undergoing geophysical exploration at yearend, and drilling reportedly was expected to begin in 1965. The smaller of the two areas, the Rio del Ray concession, extends about 70 kilometers seaward to the south from the town of Rio del Ray in extreme western Cameroon and thence east-southeast to the prominent headland about 25 kilometers west-northwest of Victoria; this concession includes about 770 square kilometers of coastal islands and rivers and 1,880 square kilometers of open water. The larger area, the Sunaga concession, extends from the mouth of the Mungo River seaward about 30 kilometers in a generally southwesterly direction and thence southeasterly to the coast at Kribi; it includes about 2,990 square kilometers of open water. Its coastal limit corresponds exactly to that of the onshore concession which this predominantly French-owned oil company has explored and drilled without a significant commercial discovery since 1951. (Reports indicate that two small oil pools and two minor gas occurrences were found but that none of these justified commercial development under present conditions.) However, SEREPCA renewed its onshore concession for 4 more years in 1964. Inland consumption of petroleum products in Cameroon reportedly was about 3,100 barrels per day in 1964, an increase of 11 percent over that of 1963.[5]

CENTRAL AFRICAN REPUBLIC

Recorded mineral production of the Central African Republic in 1964 again was confined to diamond (about 1.2 percent of the world total) and a few ounces of gold, while unrecorded output presumably again was restricted to relatively small amounts of simple construction materials. Despite the limited range of commodities produced, the mineral industry again made significant contributions to the country's overall economy, particularly with respect to the foreign trade balance; diamond exports supplied about two-fifths of total foreign exchange earnings in 1964. The value of diamond and gold output increased to an estimated $13.3 million[6] in 1964 from about $10.2 million in 1963 as a result of the 10 percent increase in diamond output and because a higher percentage of total diamond output in 1964 was of gem quality.

Official data on the gross national product (GNP) of the Central African Republic were not available for 1963 or 1964, but it was believed to have increased somewhat from the level of $51 million reported in 1962, when the value of mineral output was equal to about 9 percent of the GNP; a part of the growth in the GNP was as a result of the continued growth of diamond production.

Diamond mining apparently provided employment for about 20,000 persons in 1964, including about 15,000 who worked independently or in small groups, and about 5,000 who worked for the six private diamond companies. This was only about 4 to 5 percent of the economically active labor force that made up about 35 percent of the total population.

GOVERNMENT POLICIES AND PROGRAMS

The Government of the Central African Republic, through the Direction des Mines et de la Géologie (DMG), continued its program of reorganizing the diamond industry sector of the economy in 1964. Creation of a bourse at Bangui was aimed in part at establishing firmer control over evaluating diamond production, thereby giving the Government better control over tax assessments on diamonds. Government-directed diamond buying centers, staffed by Central Africans, were being set up to reduce the large number of non-Central African diamond buyers that had heretofore acted as middlemen.

---

[5] Petroleum Management. V. 37, No. 6, June 1965, p. 82.

[6] Where necessary, values have been converted from African Financial Community francs (CFAF) at the rate of CFAF245 equal US$1.00.

The DMG also was continuing studies aimed at expansion of mineral output in the near future. Programs for study of the establishment of a cement plant based on local limestone resources, for experimental pilot plant diamond recovery on the border of the Greseux massif, and for possible gold recovery near Pouloubou were announced.

PRODUCTION AND TRADE

In spite of increased diamond production to a new record high, gold output as a byproduct of diamond recovery was virtually unchanged from that of 1963.

TABLE 5.—Central African Republic: Production of metals and minerals

Commodity [1]	1960	1961	1962	1963	1964
Metals: Gold .... troy ounces..	289	80	100	[r] 76	75
Nonmetals: Diamond:					
Gem .... carats..	20,892	41,484	80,417	120,714	[e] 221,140
Industrial .... do....	48,749	70,000	185,000	281,650	[e] 221,141
Total .... do....	69,641	111,484	265,417	402,364	442,281

[e] Estimate. [r] Revised.

[1] In addition, construction materials such as clay, sand, and gravel are produced, but no quantitative data are available.

The expansion in diamond production and resulting increases in exports have been reflected in the improving balance of payments of the Central African Republic during 1962–64; the effect of this increase was most pronounced between 1962 and 1963, whereas between 1963 and 1964 increased exports from other sectors of the economy contributed more heavily. The contribution to total exports of mineral exports, comprising diamonds and virtually insignificant amounts of metal scrap and reexported iron, steel, and petroleum products, increased from 23.4 percent in 1962 to 48.4 percent in 1963 and then declined (as other exports rose) to 43.7 percent in 1964. Diamond exports thus remained the Central African Republic's foremost foreign exchange earner and far exceeded mineral imports in terms of value, shown as follows:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total	
Exports:			
1962	3,318	14,163	23.4
1963	10,636	21,996	48.4
1964	12,625	28,921	43.7
Imports:			
1962	3,074	25,167	12.2
1963	2,829	26,340	10.7
1964	3,370	29,848	11.3
Net trade balance:			
1962	+244	−11,004	XX
1963	+7,807	−4,334	XX
1964	+9,255	−927	XX

XX Not applicable.

Principal classes of mineral imports in terms of value and their share of total mineral imports were as follows:

Import item or group	Share of total mineral imports (percent)		
	1962	1963	1964
Aluminum	3.8	4.8	7.4
Iron and steel	28.9	17.7	25.6
Cement, lime, and dimension stone	17.3	15.6	15.9
Petroleum refinery products	40.1	47.1	37.9

Israel was the foremost recipient of mineral exports, receiving almost half of the total value of diamonds in 1963 and 1964, while the Netherlands Antilles (principal supplier of petroleum products) and France (principal supplier of other mineral commodities) ranked as leading sources of mineral imports.

TABLE 6.—Central African Republic: Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964
Metals:			
Iron and steel semimanufactures	-------	-------	7
Nonferrous scrap	-------	-------	5
Nonmetals: Diamond ......carats	175,267	[1] 364,000	418,055
Mineral fuels: Petroleum refinery products	2,095	-------	1,389

[1] Approximate.

TABLE 7.—Central African Republic: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Metals: [1]				
Aluminum	158	180	298	France 167; Cameroon 12.
Copper	13	6	20	All from France
Iron and steel:				
Pig iron and ferroalloys	4	-------	3	
Semimanufactures	4,697	2,399	3,833	France 2,153; Belgium-Luxembourg 214.
Lead	2	4	2	Mainly from France.
Tin	-------	-------	1	
Zinc	3	-------	1	
Nonmetals:				
Abrasives, natural [2]	6	-------	28	
Cement, lime, and dimension stone [2]	22,012	18,203	20,370	Republic of the Congo (Leopoldville) 7,030; Belgium-Luxembourg 4,487; France 3,502; Angola 3,100.
Clay construction materials [2]	199	207	230	West Germany 143; France 63.
Fertilizer materials, processed	1,260	1,786	2,096	France 1,623.
Stone, sand, and gravel [2]	2	-------	-------	
Miscellaneous crude nonmetallic minerals.[2]	2,755	5,110	3,839	Portuguese Guinea 3,431; Portugal 921; Senegal 570.
Nonmetallic mineral manufactures [2]	28	18	22	France 16.
Mineral fuels:				
Gas, natural and manufactured	42	234	306	France 231.
Petroleum refinery products	26,601	25,045	[3] 26,004	Netherlands Antilles 14,150; Venezuela 6,057; United States 3,085.

[1] Unless otherwise specified, items exclude ores, concentrates, and scrap, but include all other unalloyed and alloyed unwrought and semimanufactured forms.

[2] For details on specific commodities included, see section of text on source materials.

[3] Includes aviation gasoline—89, motor gasoline—11,597, and gas oil—8,211.

COMMODITY REVIEW

Metals.—*Gold.*—Gold production was a byproduct of diamond operations and the entire output was consumed by jewelers in the Central African Republic. At yearend, DMG was reported to be planning investigations of auriferous reefs at Pouloubou, a location where alluvial deposits have been regarded as uneconomic.

Iron Ore.—Exploration of iron ore deposits at Bogoin continued throughout 1964, but plans to exploit this ore reported in 1963 had not materialized by yearend. Reserves totaling 2 million tons of unspecified grade were reported in this area; these presumably included two previously reported beds of ore grading 68 percent iron extending 500 meters and averaging 6 to 8.5 meters thick and 10 meters deep. Exploration was continuing at yearend in the area south of Bogoin, in the direction of M'Poko, where there were reportedly indications of magnetite at depth in addition to surface indications of ore.

Tin.—No results were announced from investigations of cassiterite occurrences at Ippy, Bria, and Yalinga that had been scheduled for 1964.

Nonmetals.—*Cement.*—A project to assess the potential of the Bobassa limestone deposits as a basis for a cement industry was announced. The project will include sinking shafts and boreholes to determine limestone reserves as well as studies with regard to the economic effect of the entire limestone mining and cement production operation.

Diamond.—Of the total recorded 1964 diamond output, 382,872 carats or 86.5 percent were bought from licensed diggers by the Government-licensed buying office, Bureaux d'Achat, reflecting the success of governmental efforts to rationalize the diamond marketing industry. The balance of total recorded output, 59,409 carats, was produced by the private diamond mining companies. Of total recorded 1964 exports, Bureaux d'Achat accounted for 366,455 carats valued at $11.5 million, compared with 51,600 carats valued at $994,000 exported by the private diamond companies.

Of total private company production, about 41,000 carats was mined by Compagnie Centrafricaine de Mines (CENTRAMINES), the French affiliate of Diamond Distributors, Inc., of New York; the balance of company production was provided by five other firms. Data were not available to show the effect, if any, on production at the State-owned Société Nationale de Recherches et Exploitations Minières (SINAREX), formed late in 1963 to mine diamonds.

Mineral Fuels.—No commercial mineral fuel resources were known to exist in the Central African Republic at yearend 1964. Mineral fuel requirements were met almost exclusively by imported petroleum refinery products. Storage facilities at Bangui, 12 tanks with a total capacity of about 220,000 barrels, are reportedly sufficient to meet requirements during the 6 months when low waters on the Oubangi River prevent barging oil to the capital. Consumption levels for major classes of products were reported to be of the following order in 1963 and 1964:

Major product class	Thousand 42-gallon barrels	
	1963	1964
Aviation gasoline	40	43
Motor gasoline	122	[1] 121
Kerosine	35	39
Diesel oils	64	76
Total	261	279

[1] Reportedly, about 28 percent, or 34,000 barrels, was reexported for consumption in Chad.

CHAD

Mineral production continued to play an unimportant role in the economy of the Republic of Chad in 1964; production of natron, the nation's only mineral product for which output statistics are available, declined to less than 7,000 tons, from an approximate 25,000 tons in 1963. The value of natron output, estimated at about $370,000,[7] was only about 40 percent of that estimated for 1962 and 1963 (approximately $906,000 in each year), and was considerably under 1 percent of the gross national product (GNP). Recent data on Chad's GNP are not available, but it presumably exceeded the $120.9 million recorded for 1962. Value of other mineral products of Chad, believed to be confined to simple construction materials, was not available, but addition of this value would not alter the mineral product contribution to the GNP significantly.

Mineral production activities required only a small labor force, no more than a few hundred at the peak period of natron operations following the end of the rainy season in September. This may be compared with the total population of about 3.4 million.

PRODUCTION AND TRADE

Output of natron, the only mineral product of Chad for which output statistics are available, has been as follows in recent years:

Year:	*Quantity*[1] (*metric tons*)
1960	6,000
1961	12,000
1962	25,000
1963	25,000
1964	6,757

[1] Data for 1960 to 1963 are approximate; that for 1964 are from a study of natron exploitation by Chad's Ministry of Economy and Transportation.

---

[7] Where necessary, values have been converted from African Financial Community francs (CFAF) at the rate of CFAF245 equal US$1.00.

Production of simple construction materials has not been statistically recorded, but available data indicate that Chad continued to be self-sufficient in construction materials except for cement, lime, and some specific varieties of clay.

As in the case of production, Chad's exports of mineral commodities have been of little significance to the nation's economy; during 1962–64, the value of these averaged about $680,000 annually, and constituted only about 3 percent of total exports, while the average annual value of mineral imports was about $7.1 million or nearly 23 percent of total imports. Details on trade value are as follows:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total	
Exports:			
1962	802	16,545	4.8
1963	335	22,707	1.5
1964	867	26,510	3.3
Imports:			
1962	7,180	29,112	24.7
1963	6,505	29,034	22.4
1964	7,600	34,585	22.0
Net trade balance:			
1962	−6,378	−12,567	XX
1963	−6,170	−6,327	XX
1964	−6,733	−8,075	XX

XX Not applicable.

Reexported petroleum products accounted for 78 percent of the total mineral export value in 1964, slightly less than the 82 percent recorded in 1962 but far above the 32-percent level of 1963 when such shipments were very low while exports of natron, the nation's only other significant mineral exchange earner, were high.

Major mineral import groups in terms of value and their share of total mineral imports were:

Import group	Share of total mineral imports (percent)		
	1962	1963	1964
Iron and steel	15.3	15.7	18.3
Cement, lime, and dimension stone	20.9	7.3	11.2
Petroleum refinery products	56.5	68.3	62.7

Neighboring Nigeria and Cameroon remained the principal recipients of Chad's mineral exports; the Netherlands Antilles and the United States supplied the bulk of Chad's petroleum imports and thus were among Chad's principal mineral trading partners, while France again ranked as the principal supplier of other mineral commodities.

TABLE 8.—Chad: Exports of selected metals and minerals

(Metric tons)

Commodity	1962	1963	1964	Principal destinations, 1963
Metals: Otherwise undescribed nonferrous ores and concentrates	16	--------	--------	
Nonmetals: Otherwise undescribed crude nonmetals, believed to be chiefly, if not wholly, natron	4,051	6,412	5,355	Nigeria 6,180; Cameroon 223.
Mineral fuels: petroleum refinery products:				
Motor gasoline	2,713	376	2,696	All to bunkers.
Kerosine	24	5	1,190	All to Cameroon.
Residual fuel oil	57	NA	21	
Lubricating oil	NA	NA	35	
Unspecified	167	68	--------	NA.

NA Not available.

TABLE 9.—Chad: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963
Metals:[1]				
Aluminum	103	47	83	France 45.
Copper	7	7	14	All from France.
Iron and steel:				
Pig iron and ferroalloys	3	1	1	All from France.
Semimanufactures	4,909	4,711	5,525	France 4,556.
Lead	3	4	6	All from France.
Tin ... long tons	1	1	--------	All from France.
Zinc	2	3	2	All from France.
Nonmetals:				
Abrasives, natural	--------	--------	2	
Cement, lime and dimension stone[2]	18,194	9,690	13,021	France 3,289; West Germany 3,094; Republic of the Congo (Léopoldville) 2,456.
Clay construction materials[2]	202	242	165	West Germany 217.
Fertilizer materials, processed	2	--------	364	
Miscellaneous crude nonmetallic minerals.[2]	2,798	3,348	4,460	West Germany 2,392; Portuguese Guinea 404; Portugal 288.
Nonmetallic mineral manufactures[2]	26	37	42	France 35.
Mineral fuels:				
Gas, natural or manufactured	103	144	157	Nigeria 79; France 63.
Petroleum:				
Crude and partly refined	1	75	--------	All from Netherlands Antilles.
Refinery products	36,619	34,628	39,992	Netherlands Antilles 22,942; United States 8,436.

[1] Unless otherwise specified, items exclude ores, concentrates, and scrap, but include all other unalloyed and alloyed unwrought and semimanufactured forms.

[2] For details on specific commodities included, see section of text on source materials.

COMMODITY REVIEW

Metals.—Inadequately explored deposits of columbite, tin, and tungsten in the Tibesti region of Chad remained unworked in 1964, and there was no indication that these resources would be exploited.

Nonmetals.—Chad's 1964 natron output presumably came from the traditionally worked deposits near Bol, on the northeastern shore of Lake Chad. Other deposits in Borkou and Ennedi apparently remained unexploited.

Mineral Fuels.—The French firm Société de Participations Pétrolières (PETROPAR) carried out geological and seismic exploration in the half of the 77,700 square kilometer Erdis concession in the Tekro area of northeastern Chad that was retained by the company through yearend. A core-drill program consisting of five holes totaling 1,300 meters was also carried out.

Total consumption of petroleum refinery products was estimated at about 250 barrels per day.[8]

REPUBLIC OF CONGO (BRAZZAVILLE)[9]

Recorded mineral production of the Republic of Congo in 1964 was confined to gold, cassiterite, lead-zinc ore, and crude oil. In addition, simple construction materials presumably were produced for local needs, but no record of output was available. Commercial exploitation of the major deposit of high-grade potash near Holle, 40 kilometers from Pointe Noire on the Atlantic, appeared closer as a 2-year drilling program continued and a U.S. firm took an active interest.

Recorded mineral output in 1964, virtually all produced for export, was valued at about $2 million,[10] but this production contributed only marginally to the total value of mineral exports. Exports were not recorded in detail for 1964 but were believed to have approximated if not exceeded the value of $21.3 million set in 1963, when exports of domestically produced minerals including oil, together with reexports of iron and steel and petroleum products, accounted for less than 9.4 percent of total mineral exports of the Republic. Diamond, not known to be produced indigenously, accounted for nearly 90.6 percent of mineral exports and only slightly under half of all exports. Mineral exports in 1963 (and presumably in 1964 as well) were valued at over twice the value of mineral imports, but the Country nevertheless had an overall unfavorable trade balance.

Recent data on mineral industry employment are not available, but it is almost certain that less than the 2,000 persons engaged in mining in 1956 continued to obtain employment in that field. Thus, only a small fraction of the population of about 1 million are employed in mineral industry activities.

The development of a significant mineral sector in the Congo depends to a large extent upon the completion of the Kouilou Dam, 80 miles from Pointe Noire. The dam, under construction in 1964, will be capable of generating 820,000 kilowatts when and if completed according to plans. After its completion the Congo Government hopes to attract a variety of industries including an aluminum plant using imported bauxite. Among the new mineral processing industries that the Government hopes to attract to use the hydroelectric energy from this project and indigenous and/or imported raw materials, were ferromanganese, ferrosilicon, silicon carbide, magnesium, and phosphorous production facilities, as well as various metal and nonmetal fabricating industries.

---

[8] Petroleum Management. V. 37, No. 6, June 1965, p. 82.

[9] Prepared by Benjamin H. Lim, physical scientist, Division of International Activities.

[10] Where necessary, values have been converted from African Financial Community francs (CFAF) at the rate of CFAF245 equal US$1.00

GOVERNMENT POLICIES AND PROGRAMS

On September 2, 1964, an agreement was consummated between the Congolese and French Governments which provided about $2.7 million for assistance in various projects to be administered by Fonds d'Aide et Coopération (FAC). Approximately $240,000 of the total was earmarked for geological and mineral studies. In December 1964, the Soviet Union provided a credit of approximately $8.8 million to be drawn against by the Congolese Government for projects that included investigation of possible phosphate and sandstone deposits near Pointe Noire, copper, lead, and zinc deposits along the Nairi River, and gold and diamond prospects in the Mayumbe Mountains.

On January 1, 1964, the Congolese 5-year plan went into effect. One of the goals of the plan is to develop the resources of the country's hinterland. Officials of the Government believe that the Congo possesses a variety of large undiscovered mineral deposits and in an effort to find commercial mineralization, have recently enlisted Soviet and Communist Chinese assistance in mineral and geological exploration.

The overall plan called for a total expenditure of $204 million during 5 years, 28 percent of which was scheduled for rural development and 44 percent to develop industry and services. Approximately $79 million of the $204 million was earmarked for foreign capital investment. Of this $79 million, the French aid organization (FAC) will be looked to for $16 million, and Fonds Européen du Développement d'Outre Mer (FEDOM) and the European Economic Community aid organization were programmed for $31 million. The investment climate generally appeared favorable for foreign capital under a recently established investment code.

PRODUCTION AND TRADE

Sharp rises in gold, lead, and zinc production in the Republic of Congo (Brazzaville) in 1964 were roughly balanced, in terms of mineral industry income, by declines in tin ore and petroleum output. The value of mineral production totaled about $2 million, only slighly below that of 1963. Of the 1964 total, $1.2 million was accounted for by crude petroleum ($1.7 million in 1963), $598,000 by lead and zinc ore and concentrate ($56,000 in 1963), $125,000 by gold ($99,000

TABLE 10.—Republic of Congo (Brazzaville): Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:[1]					
Copper	----------	160	840	290	----------
Gold .... troy ounces	2,628	3,376	3,718	2,958	3,567
Lead	4,301	1,482	334	330	2,169
Tin .... long tons	34	46	46	43	34
Zinc	600	1,280	713	713	5,060
Mineral fuels:					
Petroleum, crude	51,847	102,939	123,393	109,217	82,506

[1] Metal content of marketable ore or concentrate produced, except gold which is fine metal recovered in mining.

in 1963), and $91,000 by cassiterite ($101,305 in 1963). Production of copper ore was suspended in early 1964 because of high production costs; the value of copper ore output in 1963 was $173,000.

Mineral exports, most important of which were diamond originating outside of the Republic, continued to be of considerable importance to the international trade balance of the Congo (Brazzaville) through 1964, when mineral contribution to total trade was assumed to be roughly on a par with that of 1963 shown in the table as follows:

	Value (thousand dollars)		Mineral commodities share of total (percent)
	Mineral commodities	Total	
Export:[1]			
1962	16,700	35,023	47.7
1963	21,283	41,631	51.1
Imports:			
1962	9,757	67,746	14.4
1963	8,292	61,755	13.4
Net trade balance:			
1962	+6,943	−32,723	XX
1963	+12,991	−20,124	XX

XX Not applicable.

[1] Excludes value of gold exported.

While the value of mineral exports was not sufficient to result in a trade balance favorable to the Republic of Congo, it clearly was a dominant factor in minimizing the trade deficit.

Aside from the value of diamond exports ($12.8 million in 1962 and $19.3 million in 1963), the most notable mineral export was crude oil, valued at $1.8 million in 1962 and $1.4 million in 1963. Metallic ore and concentrate exports were valued at $1.2 million in 1962 and $0.4 million in 1963.

Diamond do not appear among the listed imports and therefore are not counted in the value of imports but presumably all diamond exported originated outside of the Republic. Of listed mineral imports, the following commodity groups accounted for the indicated shares of total mineral imports:

Commodity group	Share of total mineral imports (percent)	
	1962	1963
Iron and steel	33.8	29.0
Cement, lime, and dimension stone	12.9	11.9
Petroleum refinery products	41.1	47.6

In 1963, Belgium-Luxembourg, as recipient of over half of the Republic of Congo's diamond exports, was the leading importer of Congolese minerals, followed by the United Kingdom and the Netherlands (both also because of the value of diamonds exported to them). France ranked fourth, receiving a small part of the diamond exports and all of the crude oil.

Foremost suppliers of mineral imports of the Republic of Congo (Brazzaville) in 1963 were France, which supplied by far the largest share of almost all nonfuel minerals as well as over 6 percent of the fuels, and the Netherlands Antilles, which supplied 40 percent of the petroleum refinery products.

TABLE 11.—Republic of Congo (Brazzaville): Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:[1]			
Aluminum, ingots and semimanufactures	16	11	Italy 10.
Copper, ore and concentrate	1,524	2,257	Japan 1,451; West Germany 804.
Gold[2]	3,926	2,765	NA.
Iron and steel:			
Scrap	1,282	880	Japan 870.
Semimanufactures	3	23	All to Rep. of the Congo (Léopoldville).
Manganese ore	15,000	(3)	
Tin, ore and concentrate ... long tons	70	39	All to Netherlands.
Uranium and thorium, ores and concentrates.	25	----------	
Zinc, ore and concentrate	311	(3)	
Other nonferrous ores	96	29	West Germany 17; France 12.
Nonmetals:			
Diamond ... thousand carats	[2] 2,629	[2] 5,684	(4).
Mineral fertilizers, processed	68	21	All to France.
Unspecified crude nonmetallic minerals	----------	6	All to Rep. of the Congo (Léopoldville).
Mineral fuels:			
Gas, natural or manufactured	10	1	All to Rep. of the Congo (Léopoldville).
Petroleum:			
Crude and partly refined	135,007	101,060	All to France.
Refinery products:			
Motor gasoline	8,062	794	All to bunkers.
Kerosine	199	2	All to Rep. of the Congo (Léopoldville).
Lubricants	185	----------	
Other	101	51	Rep. of the Congo (Léopoldville) 31; bunkers 16.

NA Not available.

[1] Other sources list export of lead and zinc concentrates as follows: 1962—4,316 tons; 1963—2,326 tons, including 1,451 tons to Japan and 822 tons to West Germany.

[2] Data from supplementary source.

[3] Exports, if any, included under other nonferrous ores.

[4] Details in terms of quantity are not available; of total value of $19.3 million, distribution was as follows: Belgium-Luxembourg, $10.7 million; United Kingdom, $5.6 million; Netherlands, $2.5 million; France, $0.3 million; and United States, $0.2 million.

TABLE 12.—Republic of Congo (Brazzaville): Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:[1]			
Aluminum	407	265	France 250; Cameroon 13.
Copper	66	38	France 37.
Iron and steel:			
Pig iron and ferroalloys	3	7	All from France.
Ingots and equivalent forms	2	--------	
Semimanufactures:			
Bars, rods, and sections	4,937	3,773	France 3,370; Belgium-Luxembourg 217.
Plates and sheets	4,090	4,637	France 3,046; Belgium-Luxembourg 1,475.
Rails and accessories	7,186	1,681	France 1,666.
Other	1,803	1,655	France 1,415; West Germany 125.
Total	18,016	11,746	
Lead	36	18	France 17.
Nickel	3	--------	
Tin ... long tons	6	5	All from France.
Zinc	12	9	All from France.
Nonferrous base metal ores and concentrates	--------	1	All from France.
Other nonferrous base metals	1	--------	
Nonmetals:			
Abrasives, natural	11	61	All from France.
Cement, lime and dimension stone[2]	61,435	49,956	France 21,728; Angola 14,851; Belgium-Luxembourg 8,558.
Clay construction materials[2]	583	580	West Germany 411; France 105.
Fertilizers, processed	1,181	2,818	France 2,586.
Stone, sand, and gravel	390	68	France 67.
Sulfur and pyrites	681	--------	
Miscellaneous crude nonmetallic minerals	3,905	4,451	Angola 2,590; Senegal 1,325; France 249.
Nonmetallic mineral manufactures[2]	58	58	France 39.
Mineral fuels:			
Coal, coke, and briquets	93	179	All from France.
Gas, natural or manufactured	826	730	France 676.
Petroleum refinery products	93,192	84,849	Netherlands Antilles 34,368; Venezuela 18,902; Italy 8,012.

[1] Unless otherwise specified, items exclude ores, concentrates, and scrap, but include all other unalloyed and alloyed unwrought and semimanufactured forms.

[2] For details on specific commodities included, see section of text on source materials.

COMMODITY REVIEW

Metals.—*Copper.*—Production of copper concentrate as a byproduct of mining lead-zinc ore from the M'Passa deposit in the Niari valley was suspended in early 1964. Operations started in 1961 by Syndicat de M'Passa (SMM) reportedly were suspended because they were uneconomical at prevailing prices for the metal.

Gold.—Gold production in 1964, about 600 troy ounces above that of 1963, continued to be carried out entirely by individuals using hand methods.

Lead and Zinc.—The M'Passa mine of SMM, an association of the Bureau de Recherches Géologiques et Minières (BRGM) and Compagnie Minière de Congo (CMC), produced 14,456 tons of concentrates containing 15 percent lead and 35 percent zinc in 1964, about 6 times greater than the 1963 output.

Tin.—Output of cassiterite (75 percent tin) fell to 47.3 tons from 58.3 tons in 1963, all from two small veins in the Mayumbe. Other scattered cassiterite deposits in the Republic remained unexploited because of high costs in mining and transportation.

Nonmetals.—*Cement.*—The Congo Government planned to construct a cement plant at Loutete, about 150 miles from Brazzaville, with an annual capacity of 80,000 tons. By 1968, it is expected that 70,000 tons of clinker will be produced, of which 50,000 tons will be consumed domestically and the remainder exported. Investment in the plant will total about $6.1 million, a third of which reportedly will be assumed by the Congolese Government as part of a bilateral agreement with West Germany, and the rest of the capital will be put up by other European governments or private investors.[11]

Potash.—Compagnie des Potasses du Congo, a joint-venture of United States, French, and Congolese interests, set up plans in 1964 to exploit the Holle potash deposit, reportedly one of the largest in the world. A drilling program in the area has been in progress for over 2 years. Output has been scheduled at an annual rate of 900,000 tons of potassium chloride when full production gets under way in 1968. Half of the production will be marketed through American Potash & Chemical Corp. and half through the French firm Mines Dominiales de Potasse d'Alsace. At this production rate, the reserve has been estimated to be sufficient to sustain mining for about 20 years. The mine and mill are about 25 miles form Pointe Noire.

In September 1964, American Potash & Chemical Corp. reportedly exercised its option on a 42.5 percent interest in Potasses du Congo, and the latter firm reportedly approached the International Bank for Reconstruction and Development (IBRD) for a loan.[12] Other partners in the joint potash concern were Mines Dominiales de Potasses d'Alsace (35 percent), Republic of Congo Government (15 percent), and Bureau du Recherches Géologiques et Minières (7.5 percent). Projected total investment was estimated at about $50 million.

The 1964 list of French aid projects in the Republic included a $61,000 feasibility study in the construction of a potash loading pier at Pointe Noire, to be needed by 1968 when commercial exports from the Holle deposits were scheduled to begin.

Mineral Fuels.—*Petroleum.*—Crude petroleum production continued to decline in 1964; the decrease was attributed chiefly to production curtailment based on revised reserve estimates. At yearend 1964, these stood at 6 million barrels of crude and 12 billion cubic feet of natural gas. The entire output came from the Pointe Indienne field near Pointe Noire, where Société des Pétroles d'Afrique (SPAFE), a firm partly owned by the French Government and acting in association with Socony Mobil Oil Co. Inc., and Koninklijke Nederlandsche Maatschappij N.V. (Shell) began operations in 1960. Off-shore exploration in the last 2 years has been unsuccessful.

The crude petroleum produced continued to be refined in France. A group of oil companies established as retailers in Congo and in neighboring countries (Central African Republic, Chad, Gabon, and Cameroon) advanced plans to construct a refinery at Port Gentil, Gabon, which would meet the need for most of the refined petroleum products in the Equatorial States and Cameroon.

---

[11] Industries et Travaux d'Outremer (Paris). Congo (Brazzaville): Le premier plan quinquennal (1964-1968) pour le développement économique du pays. 13e année, No. 135, February 1965, p. 117.

[12] Mining Journal (London). Mining Annual Review. May 1965, p. 203.

DAHOMEY

The Republic of Dahomey had no recorded mineral production in 1964, and unrecorded output was confined to a small quantity of gold produced in the northwest near Djougou, salt extracted from sea water, and simple construction materials.

Full data on 1964 trade were not available, but in 1963 mineral exports were confined to small quantities of simple construction materials apparently produced locally, and insignificant quantities of reexported metals, nonmetallic mineral products, and mineral fuels. These items accounted for less than 1 percent of total exports, while mineral commodity imports accounted for about 18.5 percent of total imports in 1963 are shown as follows:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total	
Exports:			
1962	34	10,932	0.3
1963	60	12,779	.5
Imports:			
1962	4,837	26,840	18.0
1963	6,169	33,416	18.5
Net trade balance:			
1962	4,803	−15,908	XX
1963	6,109	−20,637	XX

XX Not applicable.

The principal components of the modest mineral imports of this country of about 2.3 million persons in 1963 were iron and steel (33 percent), cement (23 percent), and refined petroleum products (32 percent). Cement imports in 1964 reportedly totaled 59,359 tons, and imports of metals for use in construction totaled 9,269 tons in 1964. Declines relative to 1963 were attributed to lower levels of building activities in 1964.

TABLE 13.—Dahomey: Exports of selected metals and minerals

(Metric tons)

Commodity	1962	1963	Principal destinations, 1963
Metals:[1]			
Aluminum	1	--------	
Copper	3	--------	
Iron and steel:			
Scrap	57	--------	
Semimanufactures	31	20	
Nonmetals:			
Abrasives, natural	--------	2	NA.
Clay construction materials[2]	33	8	Togo 4; Nigeria 4.
Stone, sand, and gravel	2,885	4,870	Togo 4,865.
Miscellaneous crude nonmetallic minerals	5	--------	
Mineral fuels:			
Gas, natural and manufactured	12	18	All to Togo.
Petroleum refinery products	56	97	Curacao 36; Togo 22.

---

[1] Unless otherwise specified, items exclude ores, concentrates, and scrap, but include all other unalloyed and alloyed unwrought and semimanufactured forms.

[2] For details on specific commodities included, see section of text on source materials.

TABLE 14.—Dahomey: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:[1]			
Aluminum	109	82	France 73.
Copper	24	32	France 30.
Iron and steel:			
Pig iron and ferroalloys	11	20	All from France.
Scrap	3	46	Mainly from Belgium-Luxembourg.
Steel ingots and equivalent forms	--------	295	All from France.
Semimanufactures:			
Bars, rods, and sections	2,123	4,693	France 3,866; Belgium-Luxembourg 636.
Plates and sheets	2,644	4,741	Belgium-Luxembourg 2,666; France 1,930.
Other	348	849	France 670.
Total	5,115	10,283	
Lead	29	37	Belgium-Luxembourg 19; France 12.
Tin long tons	2	1	All from France.
Zinc	10	4	All from France.
Nonferrous base metal ores and concentrates, not further described.	6	--------	
Nonmetals:			
Abrasives, natural	10	16	All from France.
Cement, lime, dimension stone [2]	55,822	67,755	France 46,944; Belgium-Luxembourg 7,520; Poland 7,125; Norway 5,700.
Clay construction materials [2]	562	549	West Germany 289; France 217.
Fertilizer materials, processed	1,034	174	France 150.
Stone, sand and gravel [2]	2,854	690	Nigeria 589.
Sulfur and pyrite	10	199	All from France.
Miscellaneous crude nonmetallic minerals [2]	7,798	7,621	Senegal 6,193; Nigeria 580.
Nonmetallic mineral manufactures [2]	27	18	France 16.
Mineral fuels:			
Coal, coke and briquets	8	82	All from France.
Gas, natural or manufactured	197	238	Italy 182; Venezuela 18.
Petroleum refinery products	44,940	43,453	Curaçao 13,740; Iraq 7,832; Italy 6,381; Venezuela 4,649.

[1] Unless otherwise specified, items exclude ores, concentrates, and scrap, but include all other unalloyed and alloyed unwrought and semimanufactured forms.

[2] For details on specific commodities included, see section of text on source materials.

There was some hope in Dahomean Government circles of constructing a cement plant near limestone deposits at Yamaigo Onigbolo near Pobe in southeastern Dahomey. The deposits reportedly are large enough to supply limestone for a 200,000-ton-per-year plant (the proposed plant capacity) for at least 50 years. The 200,000-ton annual capacity would be sufficient to meet all present needs of both Dahomey and Togo. A deposit of limestone at Arlan, east of Abomey, in south central Dahomey, was rated as "fair-sized" but not as promising for commercial development as those of Yamaigo Onigbolo.

The possibility of existence of phosphate rock deposits just across the Dahomey-Togo border from the now-operating Togolese deposits also has been reported. However, it was indicated that it is unlikely that the Dahomean deposits would be as large as those in Togo.

Other known mineral resources, aside from clays, sand, and gravel, included low-grade iron ore in the extreme north and apparently uneconomic deposits of chromite at an unreported location; through yearend there was no indication that these would be commercially exploited.

On December 19, 1964, the Government of Dahomey and the Union Oil Co. of California signed an agreement granting Union exclusive exploration rights for the southern part of the country as well as for offshore areas. Concessions were also held by Cabol Enterprises of Canada and Daho-American Oil Co. of the United States.

FRENCH SOMALILAND

Through 1964 there was no organized mineral industry and no recorded production or export of mineral commodities in French Somaliland. This French overseas territory, with a population of 81,000 and a land area of about 23,000 square kilometers, presumably produced sufficient quantities of simple construction materials to meet its limited requirements, but it was wholly dependent upon imports to meet its needs for all other mineral industry products. Even these were quite modest, accounting for only 0.9 percent of the total 1963 import value of about $25.7 million, and for about 2 percent of the total 1962 import value of $12.8 million.

Recorded mineral imports in 1962 and 1963 were as follows:

Commodity	Metric tons	
	1962	1963
Iron and steel semimanufactures	215	486
Cement, lime, and dimension stone	9,346	6,391
Other nonmetals	46	7
Petroleum products	823	158

GAMBIA

The British Colony and Protectorate of Gambia was to achieve full independence on February 18, 1965. It had no organized mineral producing industry through 1964. Presumably, small quantities of simple construction materials have been produced to meet at least a part of the modest requirements of the population of about 316,000 in this area of approximately 10,370 square kilometers.

The only organized mineral industry activity conducted in Gambia in 1964 was the continuation of petroleum exploration. Results of a 1963 marine seismic survey were undergoing interpretation, and BP Petroleum Development Co. Ltd. was granted an oil exploration license covering about 6,370 square kilometers of the Gambian continental shelf. This grant was to take effect January 1, 1965, and a seismic exploration program of the area was planned for the early part of that year.

MALI

Mineral production contributed virtually nothing in 1964 to the economy of the landlocked Republic of Mali, with its land area of about 1.7 million square kilometers and population of about 4.5 million. Apparently salt was still produced at Taoudeni, a small amount of gold was recovered from placers by individual operators as in past years, and simple construction materials such as clay, sand, and gravel were quarried to meet local demands, but there was no organized mineral industry, and quantitative data on output of the items produced was not available.

There was no indication through yearend 1964 of the results of geological prospecting for gold, diamond, oil, and oil shale covered under a technical assistance agreement with the U.S.S.R. signed in March, 1961. The mineral exploration program was part of an overall project including railroad construction and river navigation improvements as well. The cost of the entire program was to be covered by a $44 million credit from the U.S.S.R., and was to cover a 12-year period.

Deposits of bauxite, phosphate rock, and ores of uranium, iron, copper, and manganese, discovered prior to 1964, remained unexploited because of their uneconomic grade, small size, and/or inaccessibility.

Detailed statistics on Mali's trade for 1964 were not available, but presumably they approximated those of 1963, when mineral commodities valued at only $77,000 accounted for less than 1 percent of total exports, and mineral commodities valued at about $4.5 million accounted for 13 percent of total imports, shown as follows:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total	
Exports:			
1962	78	10,029	0.8
1963	77	10,566	.7
Imports:			
1962	4,687	45,714	10.3
1963	4,499	34,245	13.1
Net trade balance:			
1962	4,609	−35,685	XX
1963	4,422	−23,679	XX

XX Not applicable.

Mali's mineral exports in 1962 and 1963 were:

Commodity	Metric tons	
	1962	1963
Iron and steel scrap	53	42
Cement, lime, and dimension stone	15	22
Miscellaneous crude minerals, not further described	611	539
Petroleum refinery products	----------	65

Major classes of mineral imports and their shares of total mineral import values were:

Commodity group	Share of total mineral import values (percent)	
	1962	1963
Iron and steel	24.2	25.3
Cement, lime, and dimension stone	11.1	8.5
Petroleum refinery products	48.8	48.7

Principal recipients of mineral exports from Mali were nearby African countries, including Upper Volta, Niger, Mauritania, and Ivory

Coast; Venezuela and the United States (as suppliers of petroleum refinery products) and France (for most other commodities) were principal sources of Mali's 1963 mineral imports.

TABLE 15.—Mali: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals: [1]			
Aluminum, all forms	9	20	France 17.
Copper, all forms	13	17	France 15.
Iron and steel:			
Scrap	33	23	Upper Volta 10; Ivory Coast 8.
Pig iron and ferroalloys	1	1	NA.
Steel:			
Ingots and equivalent forms	4	(2)	All from France.
Semimanufactures	5,948	7,811	France 3,580; U.S.S.R. 1,632; mainlan China 522.
Lead, all forms	16	2	All from France.
Nickel, all forms	20	--------	
Tin, all forms ......long tons	2	2	France 1.
Zinc, all forms	3	1	NA.
Nonmetals:			
Abrasives, natural [3]	--------	3	All from Ivory Coast.
Cement, lime, dimension stone [3]	26,586	21,808	United States 8,972; U.S.S.R. 8,860 Poland 3,000.
Clay construction materials [3]	212	195	France 99; West Germany 68; Czechoslovakia 16.
Fertilizer materials, processed	811	3,565	U.S.S.R. 2,167; France 1,395.
Stone, sand, and gravel [3]	83	89	France 87.
Sulfur and pyrite	5	4	All from France.
Miscellaneous crude nonmetallic minerals [3]	15,305	17,386	Algeria 11,015; Poland 6,105.
Nonmetallic mineral manufactures [3]	12	14	France 12.
Mineral fuels:			
Coal, coke, and briquets	36	150	France 90; Iraq 60.
Gas, natural or manufactured	197	186	France 136.
Petroleum:			
Crude and partly refined	58	7	All from France.
Refinery products	51,962	95,923	Venezuela 30,579; United States 30,456; Iraq 15,960.

NA Not available.

[1] Unless otherwise specified, items exclude ores, concentrates, and scrap, but include all other unalloyed and alloyed unwrought and semimanufactured forms.

[2] Less than ½ unit.

[3] For details on specific commodities included, see section of text on source materials.

MAURITANIA

The first full year of operation of Mauritania's only significant operating mining venture, the Fort Gourand iron mine, resulted in the production of almost 4.6 million tons of ore, nearly 600,000 tons more than had been expected under goals set in 1963.

Reliable and recent general economic data on this nation are not available, but it is certain that the successful exploitation of the Fort Gourand iron ore deposit has had an appreciable influence on both the nation's economy and on the life of the people. The estimated value of iron ore output in 1964 was $4.1 million,[13] compared with $1.2 million in 1963; the total employment of the iron operation again, as in 1963, totaled about 2,500, including 1,500 at the mine and 1,000 at the port, out of a total national force of wage earners of about 18,500.

Events of 1964 pointed toward an even larger mineral industry contribution to the national economy as negotiations were concluded in

---

[13] Where necessary, values have been converted from African Financial Community francs (CFAF) at the rate of CFAF246.8=US$1.00.

June for an 18-month option on the Akjoujt copper property, to permit completion of technologic and economic studies. If these studies have favorable results, they may result not only in development of Mauritanian copper resources (an effort which has ended in failure on three previous occasions), but possibly in a significant expansion of salt output to provide this material for use in the proposed copper beneficiation plant's segregation process.[14]

PRODUCTION AND TRADE

Aside from the recorded output of iron ore and salt, Mauritania has produced increasing quantities of simple construction materials in recent years, partly to meet construction requirements at the iron mine and partly to meet demand stemming from construction in the new capital, Nouakchott.

TABLE 16.—Mauritania: Production of metals and minerals

Commodity [1]	1960	1961	1962	1963	1964
Metals: Iron ore ....thousand metric tons..	....	300	1,000	[r] 1,430	4,596
Nonmetals: Salt [e] ....metric tons..	800	500	500	600	600

[e] Estimate. [r] Revised.

[1] In addition, gypsum and other construction materials such as clay, sand, and gravel are produced, but no quantitative data are available.

Mauritania's iron ore exports again dominated the country's mineral export picture in 1964 and presumably gave the nation a net profit in foreign trade for the first time; that is, a profit of the order of $20 million based on an estimated value of iron ore exports of $44.8 million and the assumption that total imports did not far exceed the 1963 level of $30 million.

Statistical data on Mauritanian trade given in sources covering the overseas associate members of the European Economic Community (EEC) are incomplete in that they do not include iron ore among the list of Mauritanian exports for 1963, but other reliable sources report exports of iron ore totaling about 1,250,000 tons in 1963 and 4,983,100 tons (including about 400,000 tons accumulated from work prior to 1964) in 1964. On the basis of this additional information, the 1963 data in the following tabulation based on EEC sources has been modified to reflect the importance of the iron ore export. (Iron ore exports were even more significant in 1964 but that year is not covered in the table because data on 1964 imports were not available.)

---

[14] Mining Journal (London). Mining Annual Review. June 1965, p. 205.

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total	
Exports:			
1962	155	2,784	5.6
1963	• 11,375	• 16,425	• 69.2
Imports:			
1962	13,509	35,671	37.9
1963	3,954	30,016	13.2
Net trade balance:			
1962	−13,354	−32,887	XX
1963	• +7,421	• −13,591	XX

• Estimate.
XX Not applicable.

Principal recipients of 1963 iron ore exports were France (about 412,500 tons), Italy (about 287,500 tons), West Germany (about 262,500 tons), and the United Kingdom (about 212,500 tons). Other mineral exports during 1962 and 1963 were confined to test shipments of copper ore, small amounts of salt to neighboring countries, and reexported steel semimanufactures and petroleum refinery products, with an aggregate average annual value of only $78,000.

The sharp decline in value of mineral imports between 1962 and 1963 was due to the markedly lower import of railway track and accessories in the latter year as a result of the near completion in 1962 of a major addition to the nation's rail routes that was required to handle iron ore exports. However, the level of mineral imports in 1963 was still considerably higher than in most previous years because sizable railroad track material imports continued. Major categories of mineral imports and their share of total mineral imports were:

Commodity or commodity group	Share of total mineral imports	
	1962	1963
Railroad rails and accessories	79.6	54.1
Other iron and steel	6.9	12.7
Cement, lime, and dimension stone	4.3	7.4
Petroleum refinery products	6.8	20.3

Principal suppliers of Mauritanian mineral imports were France, which accounted for the bulk of the total in terms of value, and the Netherlands Antilles, which supplied about two-thirds of the petroleum product imports.

TABLE 17.—Mauritania: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals: [1]			
Aluminum	49	14	All from France.
Copper	19	18	France 15.
Iron and steel:			
Pig iron and ferroalloys	1	--------	
Semimanufactures:			
Rails and accessories	85, 544	16, 138	All from France.
Other	5, 529	2, 499	France 2,405.
Total	91, 073	18, 637	
Lead	8	--------	
Tin ... long tons	--------	2	All from France.
Zinc	11	--------	
Other nonferrous metals	--------	1	All from France.
Nonmetals:			
Cement, lime, dimension stone [2]	30, 646	14, 730	France 8,172; Denmark 6,540.
Clay, construction materials [2]	513	159	West Germany 131.
Fertilizer materials, processed	159	683	All from France.
Stone, sand and gravel [2]	185	--------	
Miscellaneous crude nonmetallic minerals	1, 041	76	All from France.
Nonmetallic mineral manufactures [2]	21	21	France 20.
Mineral fuels:			
Coal, coke and briquets	22	--------	
Gas, natural or manufactured	125	227	All from France.
Petroleum:			
Crude or partly refined	6	--------	
Refinery products	22, 520	22, 105	Netherlands Antilles 14,470; Venezuela 2,655.

[1] Unless otherwise specified, items exclude ores, concentrates, and scrap, but include all other unalloyed and alloyed unwrought and semimanufactured materials.

[2] For details on specific commodities included, see section of text on source materials.

COMMODITY REVIEW

Metals.—*Copper.*—In June 1964, an 18-month option, effective July 1, covering the Akjoujt copper deposit was obtained by Société de Cuivre de Mauritanie, a new company formed by Northfield Mines, Inc., the Mauritanian Government, and French financial interests including the Bureau de Recherches Géologiques et Minières (BRGM). The option was obtained in order to permit completion of studies of the economic aspects of development and of technological problems of ore treatment methods for oxide ores.

Ownership of the new company was as follows: Northfield—55 percent (including 28 percent by the Canadian Homestake group and 27 percent by the U.S. Lindsley group, the two owners of Northfield), the Government of Mauritania—25 percent, and combined French interests—20 percent.

Ore reserves of the property, about 270 kilometers north of Nouakchott, include about 18 million tons of sulfide ore averaging 1.5 percent copper and 0.008 ounce of gold per ton, and 7 million tons of oxide ore averaging 2.9 percent copper and 0.095 ounce of gold per ton.

Iron Ore.—Exploitation of the Fort Gourand iron ore deposits of Société des Mines de Fer de Mauritanie (MIFERMA) moved ahead at a more rapid pace in 1964 than had been previously expected, and the projected output goal of 6 million tons annually by 1966 seemed virtually assured. Acceleration of ore production and shipments in 1964, particularly the export of about 400,000 tons produced prior to

1964, indicated fewer transportation difficulties, which at least in part reportedly resulted from sand damage to rail equipment.

Reserves of the several deposits in the concession include about 125 million tons of proved ore and 75 million tons of probable ore, reportedly ranging from 55 to 70 percent iron and averaging 64 percent iron.

Nonmetals.—*Salt.*—The output of salt from the two opencut mines, one at Adrar near Fort Gourand and the other at N'Teret, north of Trarza, apparently continued at about the same low level as in 1963. Hope was raised that successful results from the study of the Akjoujt copper property might lead to expansion of Mauritanian salt demand by as much as 20,000 tons per year, or nearly 10 times the previous record, to meet industrial requirements for the segregation process in the proposed beneficiation plant.

Mineral Fuels.—*Petroleum.*—No activity was reported for Société Africaine des Pétroles (SAP) or Société des Pétroles de Valence (SPV) in their Mauritanian concessions in 1964. The concession of Société de Participations Pétrolières (PETROPAR) near Port Etienne was reportedly to be relinquished.

NIGER

Mineral production in the Republic of the Niger was again confined to a small quantity of tin concentrate for export, and modest amounts of simple construction materials and salt for domestic use.

The contribution of the mineral industry to the overall economy of Niger in 1964 was small. Tin concentrate output was valued at $148,571, up somewhat from that of 1963 as a result of higher tin prices, while the value of salt and construction materials produced undoubtedly was less than $100,000; thus total mineral production value was less than $250,000, compared with an estimated gross national product of about $240 million. The tin mines employed 227 persons at yearend 1964, and the 31 registered quarrying operations that supplied the recorded construction material output probably together employed no more than 200 persons, giving a total employment of less than 500, compared to a population of about 3.3 million.

GOVERNMENT POLICIES AND PROGRAMS

The Service des Mines et de la Géologie of the Ministère des Travaux Publics, des Mines et de l'Urbanisme, with a staff of about 20 persons, continued exploration activities in 1964, relying considerably on field studies performed by the Commissariat à l'Energie Atomic (CEA) and the Bureau de Recherches Géologiques et Minières (BRGM), both of the French Government.

The former group was prospecting in three areas totaling 352,700 square kilometers during 1964 and was to make detailed studies of selected parts of these areas in 1965. The latter group conducted four exploration projects of which at least one in the Agolak region led to the discovery of additional tin resources.

The Government of Niger was directly involved in mining through its 75 percent ownership of the single operating tin mining company.

PRODUCTION AND TRADE

Output of tin concentrates declined slightly in 1964, in spite of higher market prices for tin, because the number of contract miners engaged in both of the country's mining areas declined. Production was less than half of the recorded high of 147 long tons set in 1953. Construction material output was about on a par with that of 1963 and considerably lower than in 1960 and 1961 primarily as a result of reduced road construction. Increased output of these materials in 1965 was expected because of planned significant increases in road building and improvement.

TABLE 18.—**Niger: Production of minerals and metals**

Commodity[1]	1960	1961	1962	1963	1964
Metals: Tin:					
Concentrate.......long tons..	76	67	58	81	74
Metal content of concentrate.......do....	53	47	41	54	51
Nonmetals:					
Building stone.......cubic meters..	1,241	1,447	2,589	757	455
Clay, common brick.......do....	24,228	----------	----------	300	----------
Gravel.......do....	12,925	2,772	986	1,534	4,822
Sand.......do....	32,132	31,480	9,862	6,808	4,207

[1] In addition to commodities listed, Niger produces salt, but quantitative data are not available.

Mineral industry products contribute little to the nation's limited foreign trade earnings and these, in total, have not proven adequate to balance import costs as shown in the following table, which is based on data of the European Economic Community (EEC), modified in the case of exports because of inconsistencies between EEC reports and publications of the Government of Niger with respect to tin exports.

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total	
Exports:			
1962..........	•367	•14,599	•2.5
1963..........	•398	•19,791	•2.1
Imports:			
1962..........	2,250	27,461	8.2
1963..........	3,835	22,712	16.9
Net trade balance:			
1962..........	•−1,883	•−12,862	XX
1963..........	•−3,437	•−2,921	XX

• Estimate. XX Not applicable.

Available information on mineral exports of Niger are given below.

Commodity	1962	1963	1964
Tin concentrate.......long tons..	61	80	71
Miscellaneous crude nonmetals.......metric tons..	325	156	NA
Petroleum refinery products.......do....	1,913	----------	NA

NA Not available.

Tin exports, including that of 1964 valued at $160,000, have all been by truck to the Makeri Smelting Co., Ltd. in Jos, Nigeria. Other exports were to Nigeria and other nearby African States.

Mineral fuels, chiefly petroleum refinery products, accounted for over half of the total value of mineral commodities imported in 1962 and 1963; iron and steel semimanufactures ranked next with about 15 percent of total value, and cement and related materials third with about 10 percent.

TABLE 19.—Niger: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:[1]			
Aluminum	90	41	France 37.
Copper	31	11	All from France.
Iron and steel:			
Iron ore	5	--------	
Pig iron and ferroalloys	--------	2	Mainly from France.
Semimanufactures	2,031	2,295	France 2,231.
Lead	6	1	All from France.
Tin ..... long tons	(2)	6	France 3; United States 2.
Nonmetals:			
Cement, lime, dimension stone[3]	17,496	9,411	France 7,705; Belgium-Luxembourg 1,434.
Clay construction materials[3]	157	203	West Germany 165.
Fertilizer materials, processed	--------	101	Senegal 100.
Stone, sand and gravel[3]	--------	38	Italy 28.
Sulfur and pyrite	6	--------	
Miscellaneous crude nonmetallic minerals[3]	7,659	5,330	Senegal 4,091.
Nonmetallic mineral manufactures[3]	10	3	Mainly from France.
Mineral fuels:			
Coal, coke and briquets	--------	42	All from Netherlands Antilles.
Gas, natural or manufactured	298	112	France 106.
Petroleum:			
Crude or partly refined	13	--------	
Refinery products	23,953	29,657	Netherlands Antilles 16,881; Italy 4,177; United States 3,306.

[1] Unless otherwise specified, items exclude ores, concentrates, and scrap, but include all other unalloyed and alloyed unwrought and semimanufactured materials.
[2] Less than ½ unit.
[3] For details on specific commodities included, see section of text on source materials.

COMMODITY REVIEW

Metals.—*Iron Ore.*—A deposit of 100 million tons of iron ore reportedly varying in grade from 45 to 60 percent iron and averaging about 50 percent iron has been reported at Say on the Niger river, about 64 kilometers south of Niamey. Through 1964, however, the property was regarded as not economically exploitable under prevailing conditions.

Tin.—The El-Mecki and Tarrouadji tin mines near Aïr were operated by the Société Minière du Niger (formerly Société Minière du Dahomey-Niger) throughout 1964. The El-Mecki property produced about 62 percent of total Niger output in 1964; the balance came from Tarrouadji. Mining at both properties was carried out by the tribute system of contract mining, whereby miners are paid according to their individual production.

The BRGM investigations of the cassiterite potential of the Agalak massif region resulted in the discovery of three additional small orebodies near Timia, raising the total number of such deposits in that area to six. These orebodies reportedly could be commercially operated on a small scale,[15] but no decision to begin production was announced.

Uranium, Thorium, and Other Radioactive Minerals.—The CEA continued exploration of its concession areas: 55,000 square kilometers in the Teguidda In Tessoum region, 17,700 square kilometers in the Elrhaz district, and 280,000 square kilometers in an area adjacent to the Nigerian border. More detailed study of selected parts of these areas was scheduled for 1965. The BRGM study of radioactive mineral and rare metal deposits at Tamoelet apparently found no exploitable deposits.

Other.—Prospecting by the BRGM for beryl and molybdenum southwest of Aïr resulted in no finds of economic importance. Investigation of a copper amphibolite south of Tarrouadji also produced negative results. A study of alluvial gold prospects in the Liptako area was scheduled to begin in 1965.

Nonmetals.—Few details on nonmetallic mineral resources or production in Niger are available. Most of the 31 recorded construction material quarries were in the vicinity of the capital city, Niamey, and produced chiefly to satisfy the demand of public works projects for sand, gravel, building stone, and similar commodities. Salt was reportedly produced at Bilma and Manga, and natron and sodium sulfate deposits were worked near Agades.

Mineral Fuels.—Niger produces no mineral fuels, and in 1964 only the French organization Société de Participations Pétrolières (PETROPAR) was active in petroleum exploration. This firm expended about $450,000 during the year, a part of which covered two stratigraphic test holes drilled at Djado in the plains of Madama with negative results.

The country's consumption of major petroleum products, supplied wholly by imports, was reported as follows by the Service des Mines et de la Géologie of Niger:

Commodity	Thousand 42-gallon barrels				
	1960	1961	1962	1963	1964
Aviation gasoline	50	58	54	49	56
Motor gasoline	79	88	97	100	96
Kerosine	21	22	26	29	28
Distillate fuel oil	42	49	61	75	78
Total	192	217	238	253	258

Petroleum product storage capacity in Niger reported by the Service des Mines at yearend included 11,400 barrels at distribution points throughout the country and 24,800 barrels at major depots, of which 17,300 barrels was in Niamey, 3,100 barrels in Zinder, 3,000 barrels in Maradi, and 1,400 barrels at Agades. Distribution of total capacity by type of product and depot class was as follows:

---

[15] Mining Journal (London) Mining Annual Review. June 1965, p. 203.

Commodity	Thousand 42-gallon barrels		
	Major depots	Distribution points	Total
Aviation gasoline	[1] 7.5		7.5
Motor gasoline	8.9	4.9	13.8
Kerosine	1.6	2.9	4.5
Distillate fuel oil	2.9	3.6	6.5
Residual fuel oil	3.9		3.9
Total	24.8	11.4	36.2

[1] Includes 2,500 barrels capacity for jet fuel.

RWANDA

The mineral industry of the Republic of Rwanda showed an increase in output of most commodities produced in 1964 with respect to production levels of 1963, in spite of continued civil disorder that made possible extensive theft of mine products. The value of exported production, estimated at about $4.3 million in 1964, increased about 8.9 percent over that of 1963 but was still equivalent to less than 4 percent of the estimated gross national product. Mining industry employment totaling about 6,300 remained far below the level of the mid-1950's when it represented about 20 percent of the national labor force.

PRODUCTION

Mineral output, up slightly quantitatively in the case of most products and up sizably in value as a result of increased unit prices offered for tin, reportedly fell short of potential levels based on capacity and number of employees because of frequent outbreaks of violence and widespread looting.[16] In the case of tin concentrate production, it was estimated that actual output may have exceeded the reported figure by as much as 20 percent as a result of thefts from both operating mines and closed properties.[17] Concentrates stolen reportedly have been illegally exported. Gold production, not recorded officially by Rwandan authorities since 1962, reportedly has continued illegally and also reportedly was disposed of through Uganda. Such theft and smuggling are attributed to the disadvantageous exchange rate actually in use for the Rwandan franc—about one-half of the official exchange rate.

---

[16] Mining Journal (London). Mining Annual Review. June 1965, p. 195.
[17] U.S. Embassy, Kigali. Airgram A-82, Mar. 18, 1965, p. 1-2.

TABLE 20.—Rwanda: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1960	1961	1962	1963	1964
Metals:					
Beryl	281	476	357	256	298
Columbium-tantalum concentrate	[2] 48	[2] 46	37	30	29
Gold ____ troy ounces	1,566	900	[2] 29	[2] NA	[2] NA
Tin:					
Cassiterite concentrates ____ long tons	[2] 1,727	[2] 2,001	1,809	1,866	2,020
Content of concentrate ____ do	[2] 1,277	[2] 1,474	1,400	1,271	[e] 1,680
Tungsten ore and concentrate ____ gross weight	422	535	138	12	138
Nonmetals: Lithium mineral (amblygonite)	2,331	1,682	326	368	295

[e] Estimate. NA Not available.

[1] In addition, construction materials such as clay, sand, and gravel are produced, but no quantitative data are available since 1960, when output of Rwanda and Burundi was reported as follows in metric tons: Cement (from imported clinker)—2,109, sand—4,755, gravel—9,914, and stone—1,363. Data on clay was not available, but 7.8 million bricks were produced, together with unspecified quantities of pottery and tile.

[2] Recorded production; no estimate is included for illicit production smuggled out of Rwanda; this is believed to be confined to a few hundred ounces at the most.

TRADE

Rwanda's mineral trade in 1964 presumably followed the general pattern of that of 1963, when mineral exports, valued at $2.9 million, accounted for about 80 percent of total exports, while mineral and mineral product imports valued at about $1 million accounted for 21 percent of all imports. Details on export destinations and import origins are not available, but it is almost certain that Belgium, which received 80 percent of all Rwandan exports in 1963, received at least that share if not a larger share of mineral exports. In the case of imports, the principal suppliers of petroleum refinery products in 1963, Saudi Arabia and Iran, were the leading sources of mineral imports by value, providing 35 and 26 percent, respectively, followed by Belgium with 24 percent of mineral import value.

Tin concentrate and tin-columbite-tantalite concentrate accounted for 79 percent and 18 percent, respectively, of the total value of mineral exports in 1963; petroleum refinery products were the most significant group of mineral imports, accounting for 70 percent of total mineral import value.

TABLE 21.—Rwanda: Principal mineral trade in 1963 [1]

(Metric tons unless otherwise specified)

Exports		Imports	
Commodity [2]	Quantity	Commodity	Quantity
Metals:		Metals:	
Aluminum semimanufactures [3]	4	Aluminum	420
Bismuth ore and concentrate [4]	27	Copper	17
Tantalum concentrate	2	Iron and steel	464
Tin:		Nonmetals:	
Cassiterite concentrate ____ long tons	1,204	Cement and salt [5]	1,436
Cassiterite-columbite-tantalite concentrate ____ long tons	285	Mineral fuels: Petroleum refinery products	6,488
Tungsten ore and concentrate	10		

[1] Data for previous years are not available; details on origin and destination are also not available.

[2] In addition lithium mineral (amblygonite) was exported; quantitative data are not available.

[3] May include scrap.

[4] Not reported in production data; may have originated outside of Rwanda.

[5] Not reported separately.

COMMODITY REVIEW

Metals.—Société des Mines d'Étain du Ruanda-Urundi (MINETAIN) continued to rank as Rwanda's principal mining company in spite of theft and looting at company properties in 1964. The organization, with widespread holdings in Rwanda, including mines at Katumba, Musha, and near the Congo-Nile divide, and a concentrator at Katumba for separating columbium-tantalum from cassiterite, produced all of the nation's recorded output of beryl and columbite-tantalite, 43 percent of the cassiterite, and an unspecified part of the tungsten concentrate.

The country's second ranked metal mining firm, Société Minière de Muhinga et de Kigali (SOMUKI), was the only firm to record a significant gain in output, and produced 34 percent of total 1964 cassiterite production from its Rutongo area mine. Compagnie Géologique et Minière du Ruanda (GEORUANDA) was Rwanda's third-ranked mining company, and apparently produced the bulk of the 23 percent of cassiterite output not provided by MINETAIN and SOMUKI.

Nonmetals.—*Construction Materials.*—Clay for brick, tile, and pottery manufacture, and building stone (mostly quartzite) continued to be quarried but output data are not available. Building stone output was concentrated in the vicinity of Kigali, the capital.

Lithium Minerals.—MINETAIN continued as Rwanda's sole producer of amblygonite, its entire output coming from the Rongi mine. The low level of output reflects the near-exhaustion of the reserve at this property.

Mineral Fuels.—Study of dissolved methane gas in Lake Kivu was continued during 1964, and a plan for recovery of this gas was advanced by a United Nations staff member, but the economic potential of this resource remained to be proven, and there was no indication that commercial development was contemplated in the near future. The resource was estimated at almost 2,000,000 cubic feet, but the low pressure at which the gas would be obtained would present a major problem to distribution, and the absence of an established market would make financing (based on hoped for new industrial development) difficult.

SOMALI REPUBLIC

Through 1964, the Somali Republic remained an inconsequential producer of minerals, both from the domestic and the international viewpoint. Mineral production was valued at less than 0.1 percent of the nation's gross national product, which for 1964 presumably exceeded the level of $88 million[18] (current prices) estimated for 1963. Data on mineral industry employment were not available, but the limited operations, including oil exploration parties and their service forces, almost certainly provided work for no more than 1,000 persons out of the total population of about 1.97 million.

Oil exploration, the most active segment of the mineral industry in 1964, was apparently without success, but this activity was again the principal mineral industry contributor to the overall Somali economy and to the Government budget.

---

[18] Where necessary, values have been converted from Somali shillings (SoSh) at the rate of SoSh 1 equals US$0.14.

GOVERNMENT POLICIES AND PROGRAMS

No information has been made available with regard to the progress, if any, on mineral industry aspects of the 5-year plan for economic development (1963–67). This plan called for exploitation of gypsum deposits about 20 kilometers from Berbera.

The Government has indicated a desire to reestablish commercial salt production on a level comparable to that of the late 1930's, and to achieve this has solicited the cooperation of foreign governments and companies, but by yearend, no definite agreements had been reached.

PRODUCTION AND TRADE

Somali's recorded mineral output in recent years has been confined to salt, and even this commodity has been reported only for some years. Available recorded production and estimates of salt output have been as follows:

Year:	*Metric tons*
1960	[e] 7,000
1961	2,000
1962	[e] 2,000
1963	2,200
1964	5,581

[e] Estimate.

The salt production in 1964 was valued at about $49,000.

In addition, small quantities of meerschaum (sapiolite) and limestone have been regularly produced for local markets, but output has not been quantitatively reported. Estimated levels of output were 200 kilograms of meerschaum and 1,200 tons of limestone. Also, it is presumed that some varieties of clay, sand, and gravel continued to be quarried to meet at least a part of internal needs, but no details are available.

Complete details on mineral trade are not available, but exports of salt, the country's only domestically produced mineral export, apparently did not exceed significantly the 3 tons, valued at about $140, reportedly shipped to the Arabian peninsula in 1963.

European Economic Community sources giving Somali's imports show that in 1962, the total value of all of Somali's imports was $37.9 million, of which the southern region received about two-thirds and the northern region one-third. The same sources listed Somali's total mineral import value as about $3.9 million, of which $3 million was imported by the southern region and the balance by the northern region. Of the 1962 total, petroleum refinery products and liquefied gas imports were valued at $1.94 million, or 49 percent of all mineral imports. Comparable total mineral import figures for 1963 and 1964 were not available, but mineral fuel imports in 1963 were valued at $1.90 million.

TABLE 22.—Somali Republic: Imports of selected metals and minerals in 1962

(Metric tons)

Commodity	Northern region	Southern region	Total	Principal sources
Metals:				
Iron and steel semimanufactures.[1]	NA	3,812	NA	Italy 2,390; Belgium-Luxembourg 365; United States 328.
Nonferrous metals, ingots and semimanufactures.	------------	[2] 70	70	Italy 69.
Nonmetals:				
Cement, lime and dimension stone.[3]	6,144	24,965	31,109	United Arab Republic (Egypt) 12,414; Kenya 6,737; U.S.S.R. 3,053; Italy 2,598.
Fertilizer materials, processed	------------	1,542	1,542	All from Italy.
Miscellaneous crude nonmetallic minerals.[3]	177	480	657	United States 225; Italy 182 Aden 175.
Mineral fuels:				
Gas, natural or manufactured [1]	NA	144	NA	Mainly from Italy.
Petroleum refinery products [1]	NA	24,686	NA	Iran 11,485; Saudi Arabia 10,809.

NA Not available.

[1] Values only reported for northern region as follows: Iron and steel semimanufactures—$69,000 of total of $1,014,000, gas—$3,000 of total of $25,000, and petroleum—$715,000 of total of $1,876,000. Data under "Principal sources" refer only to imports of southern region.

[2] Includes aluminum—1, copper—20, lead—30, tin—3, zinc—7, and unspecified other—9.

[3] For details on specific commodities included, see section of text on source materials.

COMMODITY REVIEW

Metals.—There was no indication in 1964 that any of Somali's metalliferous resources would be exploited in the near future. These included low grade iron ore of which 200 million to 400 million tons averaging about 38 percent iron have been reported at Bur Galan; unspecified, but apparently small quantities of manganese silicate rocks at Hudiso; undetermined quantities of titaniferous sands at the mouth of the Juba River; questionably economic, and apparently small tin deposits at Dalan; and a pegmatite dike in the Humbeli Range previously worked for beryl and columbite as well as for mica and feldspar.

Nonmetals.—*Feldspar.*—No indications of results of prospecting operations in the Humbeli Range pegmatites were reported in 1964, nor was there any indication that any progress had been made to develop transportation lines deemed necessary to make economic operation of these deposits possible.

Salt.—Although the Somali Government indicated a desire to reopen the Republic's solar evaporation salt facilities near Ras Hufun, there was no tangible progress reported on this program. Most of the equipment for the 300,000-ton-per-year plant that operated before World War II was removed by British military forces in 1941.

Mineral Fuels.—*Petroleum.*—Of the three companies holding concessions in the Somali Republic at the start of 1964, one, Mobil Petroleum Co., relinquished 14,160 square kilometers of its concession area in March, suspended exploration in July, and at yearend gave 1 year notice of its intention to surrender its remaining concession area. Sinclair Somal Corp. continued seismic exploration and at yearend had drilled to 11,167 feet in its Giamama No. 1 test, near the mouth of the Juba River in southwest Somali. The firm had completed its unsuccessful Oddo Alimo No. 1 at 14,648 feet in November. Somali

Gulf Oil Co. relinquished 32,047 square kilometers of its exploration area on June 18, but continued to be the most active company with regard to exploration, with an aggregate of 23 party months in all aspects of exploration, including surface geological, seismic, gravimetric and photo geological work, to its credit. As a result of this activity apparently, the firm reportedly was planning to drill two deep tests in 1965.

Refined petroleum product consumption in the Somali Republic in 1964 was reportedly about 700 barrels per day.[19]

TOGO

Phosphate rock remained the Republic of Togo's only recorded mineral product in 1964. Togolese output was about 1 percent of world output, and the country was the fifth largest African producer of the commodity. The value of 1964 production, estimated at about $7.7 million[20] compared to an estimated gross national product of about $130 million, ranked phosphate mining as one of the more important industries in Togo.

The phosphate operation employed about 700, a small part of the labor force of this country of about 1.6 million.

PRODUCTION AND TRADE

Output of crude phosphate rock increased to 1,550,000 tons in 1964 from 1,068,106 tons in 1963. Output of salable phosphate rock produced from this material has been reported as follows:

Year:	*Metric ton*
1961	117, 897
1962	193, 000
1963	587, 500
1964	552, 000

Of the total 1964 output, 550,000 tons was rated as "first quality' product, containing 80 to 81 percent $Ca_3(PO_4)_2$, and 2,000 metric tons was classified as "second quality" product, containing 73 to 75 percent $Ca_3(PO_4)_2$.

In addition to phosphate rock, Togo also presumably produced sufficient quantities of simple construction materials (sand, gravel, and crushed stone) to meet its modest requirements; output of these materials has never been reported quantitatively.

Increases in phosphate rock exports during 1962–64 have markedly improved the country's foreign trade balance, but preliminary and partial data indicate that the value of total exports had not yet balanced that of total imports by yearend 1964. Despite the $2.3 million increase in phosphate rock exports between 1962 and 1963 (the last year for which overall trade data were available), declines in nonmineral exports and increases in imports in 1963 resulted in a greater foreign trade debt in that year than in 1962, shown as follows:

---

[19] Petroleum Management. V. 37, No. 6, June 1965, p. 105.

[20] Where necessary, values have been converted from African Financial Community francs (CFAF) at the rate of CFAF245 equal US$1.00.

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total	
Exports:			
1962	2,028	17,173	11.8
1963	4,396	18,265	24.1
Imports:			
1962	3,971	27,093	14.7
1963	4,868	29,031	16.8
Net trade balance:			
1962	−1,943	−9,920	XX
1963	−472	−10,766	XX

XX Not applicable.

The continued rise in phosphate rock exports through 1964 to a total of about 768,000 tons of first grade product valued at an estimated $7.9 million apparently reduced the foreign trade debt in that year to about $7 million, and was possible in part because of a drawdown of some 216,000 tons from stocks accumulated in previous years.

Details on Togolese 1964 phosphate rock export destinations were as follows:

Country:	*Metric tons*	Country (Con.):	*Metric tons*
Australia	132,000	Belgium	71,000
France	122,000	Italy	67,000
Japan	106,000	West Germany	40,000
Netherlands	99,000	United States	36,000

The increase in mineral import values of nearly one-fourth between 1962 and 1963, was chiefly the result of increasing iron and steel and petroleum product imports. France remained the chief source of nonfuel imports, while the Netherlands Antilles was the foremost supplier of petroleum refinery products.

TABLE 23.—Togo: Exports of selected metals and minerals

(Metric tons)

Commodity	1962	1963	Principal destinations, 1963
Metals: Iron and steel scrap	77	530	Italy 525.
Nonmetals:			
Fertilizer materials: Phosphate rock	184,725	441,434	Brazil 100,798; Italy 100,364; France 63,968; Japan 52,276; United States 39,752.
Stone, sand, and gravel	544	116	NA.
Miscellaneous crude nonmetallic minerals.	1,192	1,249	Niger 1,023; Ghana 136; Dahomey 91.
Mineral fuels: Petroleum refinery products	38	6	Dahomey 5.

NA Not available.

TABLE 24.—Togo: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962 [r]	1963	Principal sources, 1963
Metals:[1]			
Aluminum	62	52	All from France.
Copper	7	12	France 8; Algeria 4.
Iron and steel:			
Pig iron and ferroalloys	1	5	All from France.
Scrap	97	65	All from Ghana.
Semimanufactures:			
Bars, rods, sections	994	2,055	France 1,170; Belgium-Luxembourg 794.
Sheet and plate	2,068	2,778	Japan 1,651; Belgium-Luxembourg 704.
Rails and accessories	1,479	4,546	France 4,457.
Other	524	677	France 495.
Total	5,065	10,056	
Lead	33	33	Belgium-Luxembourg 26.
Tin long tons	(2)	4	West Germany 3.
Zinc	2	3	France 2.
Nonferrous metal ores and concentrates, not further described	--------	2	France 1.
Nonmetals:			
Abrasives, natural	2	--------	
Cement, lime, dimension stone [3]	45,300	40,578	Poland 12,139; Belgium-Luxembourg 11,510; Yugoslavia 9.493.
Clay construction materials[3]	231	378	West Germany 202; France 152.
Stone, sand, and gravel [3]	338	1,466	Dahomey 1,342; France 85; Italy 29.
Miscellaneous crude nonmetallic minerals [3]	9,329	11,061	Spain 7,328; Senegal 2,993.
Nonmetallic mineral manufactures	841	22	France 14.
Mineral fuels:			
Coal, coke, and briquets	135	74	Nigeria 53.
Gas, natural or manufactured	118	103	France 70; Nigeria 14.
Petroleum refinery products	30,823	37,285	Netherlands Antilles 22,307; Venezuela 7,438; Iraq 6,086.

[r] Revised.

[1] Unless otherwise specified, items exclude ores, concentrates, and scrap, but include all other unalloyed and alloyed unwrought and semimanufactured materials.

[2] Less than ½ unit.

[3] For details on specific commodities included, see section of text on source materials.

COMMODITY REVIEW

Metals.—Limited extent of mineralization, marginal grade, and/or high anticipated production costs continued to preclude development of Togo's metallic ore resources. These included limited bauxite resources in the Mont Agou area, chromite near Ahito, iron ore at Bangéli, and manganese north of Dapango.

Nonmetals.—*Phosphate Rock.*—The Hahotoe mine, owned by Compagnie Tongolaise des Mines du Bénin (CTMB), continued to be the nation's sole phosphate rock producer. The firm, in which W. R. Grace & Co., holds about 43 percent of the stock, reportedly planned to increase its output capacity to 1.2 million tons a year. At a stockholders' meeting in September, capital of the firm was increased from about $8.5 million to $9.6 million to provide funds for the expansion, and the board of directors was authorized to increase capital to about $12.2 million without further consulting the stockholders.

UPPER VOLTA

Gold remained the only mineral product of the Republic of Upper Volta (Haute Volta) for which any production records are available, and in the case of this commodity, data are available only for the one commercial operation. An extensive mineral survey continued, and while some indications of possibly commercial mineralization were reported, there was no indication that exploitation efforts were in the offing.

Data on the gross national product (GNP) for 1964 or 1963 are not available, but it almost certainly exceeded the $183 million[21] reported for 1962. In that year, gold output valued at about $1.4 million was equivalent to only 0.8 percent of the GNP.

Gold mining employed only about 600 persons, a small part of the labor force of this country of about 4.7 million persons.

GOVERNMENT POLICIES AND PROGRAMS

The extensive mineral resource survey programmed in Upper Volta's original 5-year development plan for 1963–67 continued with financial assistance from France and the United Nations Special Fund. This survey is being conducted under the direction of the Direction de la Géologie et des Mines (DGM) and the Bureau de Recherches Géologiques et Minières (BRGM).

PRODUCTION AND TRADE

Gold output of Upper Volta declined by about 26 percent in 1964, as the single operating mine apparently approached depletion. Output of gold in recent years has been recorded as follows:

	Troy ounces
1960	1, 161
1961	15, 497
1962	39, 770
1963	44, 786
1964	p 33, 200

p Preliminary.

The marked increase in output in 1961 and the rising production through 1963 was the result of expansion of the single mine.

Simple construction materials—clays, sand, gravel, and similar materials—apparently continued to be produced in quantities sufficient to meet local demands, but quantitative data on output are not available.

The mineral industry of Upper Volta has made little contribution to the nation's mineral export value except for the presumed sale of gold on the export market; even if the value of all gold produced were added to the value of other commodities exported, Upper Volta's foreign trade would remain decidedly unbalanced in favor of imports shown as follows:

---

[21] Where necessary values have been converted from African Financial Community francs (CFAF) at the rate of CFAF245 equal US$1.00.

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total	
Exports:[1]			
1962	273	6,702	4.1
1963	313	8,151	3.8
Imports:			
1962	3,321	34,642	9.6
1963	3,767	36,997	10.2
Net trade balance:			
1962	−3,048	−27,940	XX
1963	−3,454	−28,846	XX

[1] Excludes value of gold production, presumably exported, which was estimated at $1.39 million in 1962 and $1.60 million in 1963.

XX Not applicable.

Aside from gold, Upper Volta's most significant mineral export recorded in terms of value was otherwise unspecified nonferrous metal ores and/or concentrates which have been exported to Sweden, but the shipments of these materials, valued at $250,000 in 1962 and $238,000 in 1963, are trivial even by comparison to the nation's very modest total exports.

The most important mineral imports in terms of value again in 1963 were iron and steel, with 30.6 percent of total mineral imports; cement, lime, and dimension stone (16.0 percent); and petroleum refinery products (33.3 percent).

France was the foremost supplier of Upper Volta's mineral imports in 1963, supplying most of the nonfuel commodities and about one-eighth of the mineral fuels. Cuba supplied about 41 percent of the petroleum refinery products and by doing so, ranked second to France among Upper Volta's mineral commodity trading partners in 1963.

TABLE 25.—Upper Volta: Exports of selected metals and minerals

(Metric tons)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Iron and steel:			
Scrap	86	24	All to Ivory Coast.
Semimanufactures	8	67	Mali 39.
Nonferrous metal ores and concentrates, not further described.	732	771	Sweden 755; Czechoslovakia 16.
Nonmetals:			
Cement, lime and dimension stone	13	--------	
Miscellaneous crude nonmetallic minerals	29	604	Ghana 360; Mali 126; Senegal 79.
Mineral fuels: Petroleum refinery products	109	299	Venezuela 166; Mali 58.

TABLE 26.—Upper Volta: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:[1]			
Aluminum	43	17	Mainly from France.
Copper	102	77	France 51; United States 26.
Iron and steel:			
Scrap	677	569	Belgium-Luxembourg 101; United Kingdom 85.[2]
Steel ingots and equivalent forms	1	--------	
Semimanufactures:			
Bars, rods, and sections	2,373	2,535	France 2,442.
Plates and sheets	2,301	3,118	France 2,431; Belgium-Luxembourg 641.
Other	762	537	France 505.
Total	5,436	6,190	
Lead	12	9	All from France.
Tin ...long tons	2	--------	
Zinc	3	2	All from France.
Nonferrous ores and concentrates, not further described.	63	--------	
Nonmetals:			
Abrasives, natural	36	--------	
Cement, lime, and dimension stone[3]	27,484	28,051	France 25,046; West Germany 1,872.
Clay construction materials[3]	315	437	West Germany 375.
Fertilizer materials, processed	181	287	France 213.
Stone, sand and gravel[3]	27	61	France 47; Morocco 14.
Sulfur and pyrites	10	11	All from France.
Miscellaneous crude nonmetallic minerals[3]	7,458	11,506	Senegal 6,889; Algeria 1.867; Mali 938.
Nonmetallic mineral manufactures[3]	78	61	France 39; West Germany 17.
Mineral fuels:			
Gas, natural or manufactured	188	202	France 188.
Petroleum refinery products	29,988	31,641	Cuba 12,908; Syria 8,667; France 4,444, Kuwait 4,160.

[1] Unless otherwise specified, items exclude ores, concentrates, and scrap, but include all other unalloyed and alloyed unwrought and semimanufactured materials.

[2] Origin of 258 tons of total not reported.

For details on specific commodities included, see section of text on source materials.

COMMODITY REVIEW

Metals.—*Gold.*—The Poura gold mine, 175 kilometers southwest of Ouagadougou, continued operations throughout 1964, although production was below that of 1963. The mine was operated by Société des Mines de Poura, a firm owned jointly by a private French company and the French Government's BRGM. A recent report [22] indicates that reserves remaining totaled only about 245,000 tons of ore (2½ years supply at the 1963 production rate of about 98,000 tons of ore). However, it was not made clear if this figure included the 152,000 tons of ore in a neighboring outcrop reported in mid–1962, together with 416,000 tons of ore in the mine itself, nor was it indicated whether the 245,000-ton figure was an absolute limit or if previous indications that ore reserves could be maintained were still valid.

Moreover, it was not clear if the decline in output in 1964 resulted from lower ore output or from declining grade of ore, reported as about 0.45 ounce per ton in 1963. Original targets for 1964 output were extraction of 114,000 tons of ore, treatment of 117,500 tons of ore, and recovery of about 52,900 ounces of gold.

---

[22] Mining Journal (London). V. 264, No. 6766, Apr. 23, 1965, p. 317–318.

Manganese ore.—Deposits of manganese ore at Tambaou, Tiéré, and Soukoura have been reported to be of commercial interest. At Tambaou, the deposit reportedly contains 10 million tons of metallurgical manganese ore (51 percent manganese). This deposit, however, is remote from existing transportation facilities and 1,000 kilometers from the sea, and in an area where water supplies are inadequate. The Tiéré deposits are better situated from the viewpoint of transportation and water availability, but the reserve reported here is only 500,000 tons of ore containing 40 percent manganese. The Soukoura deposit, 110 kilometers east of Banfora and near the Bangora-Gaoura highway, is a ferruginous manganese deposit reportedly containing 29.5 percent manganese and 15 percent iron. Indications of manganese ore have also been reported at Gonsponson, Kongoussi, Kokoi, Kari, and Kaya-Koto, but no details are available.

SOURCE MATERIALS

Prinicipal sources of information on general activities of mineral producers and on output by the various countries covered in this chapter were professional trade journals, notably the Mining Journal (London) and Foreign Service despatches from the various U.S. embassies and other posts in the countries involved. In the case of a few countries, official governmental reports issued by the country's Bureau of Mines or its functional equivalent were of considerable value in supplying output data for various individual operations and details on exploration and production activities. Summaries of petroleum activities in most of the countries were based primarily on information given in the Bulletin of the American Association of Petroleum Geologists for August 1965 (V. 49, No. 8, pp. 1101–1376), the issue of that journal reviewing international activities during 1964, supplemented by Foreign Service reporting.

Trade information for most of the countries covered in this chapter was obtained from the publication Foreign Trade of Associated Overseas Areas of the European Economic Community published by the Statistical Office of that organization. These data depart somewhat from that given in the preceding issue of the Minerals Yearbook, Volume IV, Area Reports: International, in that they include a number of general reporting categories each of which encompasses a number of mineral commodities. The following table summarizes the items included within each of these categories:

Descriptive category used in trade tables in this chapter	SITC category number [1]	Full list of items included
Abrasives, natural	275	Industrial diamonds; dust and powder of natural or synthetic precious or semiprecious stones; infusorial earths; pumice stone; emery; natural corundum and other natural abrasives.
Cement, lime, and dimension stone.	661	Cement (all types); lime; worked building and monumental (dimension) stone; asbestos cement and fiber cement building materials including vegetal substances agglomerated with mineral binding substances; asphalt building materials.
Clay construction materials.	662	Refractory bricks and other construction materials of infusorial earths, kieselguhr, and siliceous earths, other; refractory bricks; refractory cements and mortars; nonrefractory ceramic bricks, tiles, piper and similar products including roofing tiles, ceramic piping, unglazed tile and glazed tile.
Stone, sand, and gravel	273	Building and monumental (dimension) stone, not further worked than roughly split, roughly squared or squared by sawing (including sandstone, slate, marble, limestone, granite, porphyry, and others); gypsum; plasters; limestone flux; calcareous stone used for manufacture of lime and cement; sand (excluding metal-bearing sand); gravel and crushed stone (including tarred macadam).
Miscellaneous crude nonmetallic minerals.	276	Natural asphalt and bitumen; clays and other refractory minerals including graphite, dolomite and magnesite; salt; asbestos (crude washed or ground, including asbestos waste); mica; feldspar; fluorspar; cryolite; chiolite; natural quartz; quartzite; slag, dross, scalings and similar waste from iron or steel manufacture (except Thomas slag); chalk; earth colors; barite; witherite; meerschaum; amber; jet; steatite; talc; natural arsenic sulfides; crude borate minerals; and others not specified.
Nonmetallic mineral manufactures.	663	Abrasive products such as grinding wheels, grinding stones, abrasive cloths, and abrasive papers; worked mica, mineral insulating materials other than in the crude mined state; articles made of plaster, cement, concrete or artifical stone; refractory products other than refractory construction materials; asbestos manufactures; and ceramic materials, not elsewhere listed, including laboratory and industrial ceramic products.

[1] Standard International Trade Classification categories, as outlined in: Standard Industrial Trade Classification Revised, Statistical Papers Series M, No. 34, Statistical Office of the Department of Economic and Social Affairs, United Nations, New York 1961.

It should be pointed out however, that while there is a great variety of items which may be included in each of these groups, it is unlikely that many of the individual items listed were traded in any substantial quantities by the subject countries of this chapter. For example, the great bulk of the trade listed under category 661 undoubtedly was either cement or lime, and the bulk of the material in category 662 that was traded was probably simple brick, tile and ceramic piping. Such generalizations however cannot be made for the other four categories.

Regional Mineral Industry Review of the Near East

By James A. West[1]

◆

COUNTRIES of the Near East, with the world's largest and most prolific petroleum resources, produced nearly 27 percent of the world's estimated total output of crude oil in 1964 and accounted for about 60 percent of world exports of this commodity. Although petroleum largely dominated the mineral industry of the area, production of antimony, chromium, copper, mercury, boron, potash, and phosphate rock was of world significance.

Production of crude oil in Near East countries reached a record high of 7,520,000 barrels per day in 1964, an increase of nearly 11 percent over that of 1963. Kuwait maintained its position as the leading producer, accounting for almost 28 percent of the area's output. Saudi Arabia, Iran, and Iraq followed with 22.5, 22.2, and 16.5 percent of total area output, respectively. Despite record production, the Near East proved crude oil reserve remained in excess of 211 billion barrels, or more than two-thirds of the estimated world proved crude oil reserve.

Output of crude oil and refinery products in 1964 was valued at almost $5 billion and accounted for nearly one-fourth of the combined gross national product (GNP) of all area countries. Also, petroleum provided an estimated $2,089 million in government revenues and contributed the major portion to the foreign exchange of the area.

Major petroleum industry developments in 1964 included the continued development of offshore oilfields in the Persian Gulf; an announced program for major commercial exploitation of reserves in Oman; the opening by Iran of major areas in the Persian Gulf for oil concession bids; and the award of contracts for the establishment of new oil refineries and petrochemical plants in several countries.

During 1964, government participation in oil industry earnings and operations increased. Negotiations between oil concessionaires (comprised of oil companies of many national origins) and the Organization of Petroleum Exporting Countries (a semiofficial body representing the Governments of Kuwait, Saudi Arabia, Qatar, Iran, and Iraq), resulted in a tentative agreement for settlement of long-standing disputes over the methods of accounting for royalty oil production, crude oil pricing, and marketing expenses. The agreement, subject to ratification by the individual countries, provides for the expensing of royalty payments rather than crediting such payments directly against income taxes. In effect, this agreement modifies the present profit-sharing arrangements so that the producing countries receive more benefits.

---

[1] Chief specialist, Near East and South Asia, Division of International Activities.

In Iraq, the Iraqi National Oil Co. was officially established to administer the development of all oil concession areas except those allocated to Iraq Petroleum Companies group (IPC group) under Law 80 of 1961. The IPC group has not accepted the legality of this law which withdrew most of the oil concession area previously allocated to IPC. Efforts to resolve this dispute were continued during the year.

National oil companies in Iran, Kuwait, and Saudi Arabia expanded marketing operations and announced plans for new refinery and petrochemical plant construction. The Syrian Arab Republic announced the nationalization of all industries, including oil.

TABLE 1.—Near East: Salient statistics of the petroleum industry in 1964

Country	Production (thousand 42-gallon barrels)		Exports (thousand 42-gallon barrels)		Estimated reserves (million 42-gallon barrels)	Estimated revenue to governments (million dollars)	Estimated value of production, (million dollars)	GNP (million dollars)
	Crude oil	Refinery throughput	Crude oil	Refinery products				
Aden	----------	50,080	----------	59,864	----------	68	157	170
Abu Dhabi	67,465	----------	67,465	----------	7,700	20	118	[e] 125
Bahrain	18,000	79,300	----------	70,173	240	28	180	[e] 200
Iran	618,731	138,801	469,994	100,551	38,000	450	1,000	5,030
Iraq	459,290	[e] 20,050	440,988	[e] 250	25,000	353	750	[e] 1,650
Israel	1,550	21,031	----------	[e] 1,600	30	----------	45	2,700
Jordan	----------	[e] 2,685	----------	[e] 5	----------	----------	5	350
Kuwait	774,816	78,107	696,675	73,381	63,000	575	1,232	1,300
Kuwait-Saudia Arabia Neutral Zone	131,416	31,804	108,792	22,271	12,500	----------	190	--------
Qatar	79,955	218	79,580	----------	3,500	65	150	150
Saudi Arabia	628,095	107,701	527,011	91,263	60,000	520	1,100	1,200
Syria	----------	7,108	----------	[e] 300	500	----------	15	800
Turkey	5,897	20,966	----------	5,200	700	10	35	7,250
Total	2,785,215	557,851	2,390,515	424,858	211,170	2,089	4,977	20,925

[e] Estimate.

In addition to petroleum, Near East countries produced and exported important quantities of certain metallic and nonmetallic minerals. Turkey partially regained export markets for chromite that were lost in recent years, and chromite production in 1964 was 45 percent greater than that of 1963. Iran also produced significant quantities of chromite, and the combined production of Near East countries was nearly 15 percent of the world total 1964 output. Turkey produced significant quantities of antimony, blister copper, and mercury, accounting for 2.8, 0.5, and 1.2 percent, respectively, of world output. Turkey produced an estimated 15 percent of world output of boron minerals in 1964. Production of potash in Israel and phosphate rock in Israel and Jordon accounted for 1.1 to 2.5 percent of world output of these commodities in 1964. Exports of Israel's diamond cutting and polishing industry were valued at $116 million in 1963, ranking Israel as the third largest processor of diamonds in the world.

Near East countries continued to depend on imports of most metals and nonmetals to meet the requirements of their growing economic development. The Karabuk and Eregli steel plants in Turkey are the area's only integrated steel plants, and essentially all steel produced was consumed in Turkey. Accordingly, as industrialization increased, steel continued to be the area's largest metal import. Despite increased production of fertilizers and planned development of petrochemical plants, requirements for fertilizers are extensive and expanding as improved farming methods are adopted in an effort to increase agricultural output.

Development of mineral resources other than petroleum continued to be prominent in government plans and programs. Major mineral industry developments in the Near East during 1964 follow: Turkey's Eregli steel mill began limited production; Israel increased the capacity of its Dead Sea works to produce potash; Jordan increased its output of phosphate rock; and Iran expanded its development of chromite and lead-zinc deposits.

The Mineral Industry of Bahrain

By James A. West[1]

◆

PETROLEUM refining and crude oil production remained the only significant mineral industry of the island of Bahrain in 1964. Bahrain's 250,000 barrels per day refinery operated at about 82 percent of capacity and produced about one-sixth of the Middle East area's output and one-fourth of its exports of petroleum products. The refinery has operated largely on imported Saudi Arabian crude oil but regularly processes all local production. Crude oil production rose in 1964 to 49,180 barrels per day, a significant but relatively small (less than 1 percent) part of Middle East output.

Bahrain has traditionally served as the leading trade center for the lower Persian Gulf area. The early establishment of its oil industry and new oil discoveries and developments in nearby coastal States has strengthened this position. This trade produces about 20 percent of government revenue. Petroleum revenues (chiefly from refining) estimated at $28 million in 1964 were the source of most foreign exchange and about 80 percent of total government revenue.

Approximately 5,000 persons were employed directly by the petroleum industry. Indirectly, its earnings support a large share of local business and construction activities and provide most of the island's industrial employment.

GOVERNMENT POLICIES AND PROGRAMS

The Government began work on large housing development projects during 1964. Completion of 2,500 homes in the town of Shaykh Isa is expected in 1965. Plans call for completion of two additional projects of identical size in the next 5 years.

Bahrain planned to introduce its own currency, the Bahrain dinar (equal to $2.10), in July 1965 to replace the Gulf rupee. The new currency is to be fully backed by British deposits and securities and is expected to be freely convertible.

PRODUCTION

Petroleum was the only significant mineral product. The Bahrain Petroleum Co. (BAPCO), owned jointly by Texaco Inc., and Standard Oil Co. of California, was the only operating company. All crude oil production came from the Bahrain fields.

---

[1] Chief, Near East-South Asia specialist, Division of International Activities.

In recent years the producing rate had been quite steady at about 45,000 barrels per day; however, in 1964 the field rate averaged 49,180 barrels per day. This increase resulted from modifications in the production program, completion of additional development wells, and use of new well stimulation techniques.

TABLE 1.—Bahrain: Production of minerals

(Thousand 42-gallon barrels)

Commodity[1]	1960	1961	1962	1963	1964
Crude petroleum	16,500	16,444	16,446	16,503	18,000
Refinery products:					
Gasoline	14,329	13,577	16,815	16,361	16,704
Jet fuel	2,876	4,715	5,972	5,138	6,580
Kerosine	6,445	4,920	4,532	4,228	3,469
Distillate fuel oil	16,870	18,412	20,410	19,804	15,764
Residual fuel oil	29,620	31,483	34,827	33,362	27,682
Other	1,266	1,150	379	187	740
Total	71,406	74,257	82,935	79,080	70,939
Refinery fuel and loss	4,725	5,632	5,745	5,608	8,361

[1] In addition to commodities listed, small amounts of construction materials are produced ,but quantitative data on output are not available.

TRADE

Refined petroleum products remained the only significant mineral exports. In 1964, the gross value of these exports was an estimated $180 million.

Crude petroleum imports, via two 12-inch diameter, 54-kilometer pipelines from Saudi Arabia, averaged 156,369 barrels per day.

During recent years, no statistics are available on imports other than petroleum. Published reports[2] indicate that total imports were valued at $69.5 million in 1963 and had reached $56.0 million in the first 9 months of 1964. Normally, about one-third of all imports are reexported, with about half to Saudia Arabia and the other half to Qatar, the Trucial States, and Iran. It was reported that $10 million in reexports to Saudi Arabia have been threatened by recent regulations.

---

[2] International Commerce. V. 71, No. 5, Feb. 1, 1965, p. 24.

TABLE 2.—Bahrain: Imports, exports, and bunker deliveries of crude oil and petroleum refinery products [1]

(Thousand 42-gallon barrels)

Commodity	1962	1963	1964
Imports:			
Crude oil	71,934	66,450	57,231
Petroleum refinery products:			
Gasoline	352	893	1,159
Lubricants	6	8	5
Exports:			
Petroleum refinery products:			
Gasoline	16,177	16,848	16,544
Jet fuel	5,468	5,125	6,429
Kerosine	4,518	4,245	3,247
Distillate fuel oil	19,574	19,032	15,454
Residual fuel oil	29,944	28,961	21,597
Other	799	162	630
Total	76,480	74,373	63,901
Bunker deliveries:			
Distillate fuel oil	649	394	206
Residual fuel oil	4,798	4,687	6,066

[1] Data on origin of imports and destination of exports not available.

COMMODITY REVIEW

MINERAL FUELS

Petroleum and Natural Gas.—Bahrain's only oilfield, located onshore in the southern part of the island, continued to produce 33° to 36° API gravity crude oil from the Bahrain and Fourth Pay sand zones of Cretaceous formations at 2,200 and 4,500 foot depths, respectively. Development drilling in the Bahrain field resulted in increased output and maintained crude oil reserves at an estimated 240 million barrels. BAPCO completed 8 new wells in the field, bringing the total number of oil-producing wells to 180 at yearend.

There were no important exploration developments within the country but active delineation and development drilling in the offshore Abu Safah field was pursued by the Arabian American Oil Co. (ARAMCO). This field is an offshore area between Bahrain and Saudi Arabia wherein both Governments agreed to share equally in profits from oil developments prior to initial drilling by ARAMCO. As operator, ARAMCO has drilled nine wells in the field since its discovery in 1963. It is expected that the field will be in production by mid-1966.

The BAPCO refinery operated at 82 percent of capacity, processing crude oil at an average rate of 205,000 barrels per day.

Natural gas produced with crude oil and dry gas from several wells completed in deep Permian formations were used as fuel and for reinjection and pressure maintenance in the Bahrain field. In 1964, an estimated 20 million cubic feet per day was supplied to the Government-owned powerplant.

The Mineral Industry of Cyprus

By E. Shekarchi[1]

MINING has been important to the economy of Cyprus, providing employment for 2 percent of the total labor force of about 247,000. Also, mining contributed 8 percent of gross national product (GNP) and accounted for about half of the total exports, $62 million.[2] GNP was estimated at $280 million in 1964, which was similar to that of 1963. Cypriots showed a per-capita income in 1964 of about $470, which was higher than in the neighboring countries of Turkey or Greece.

Cyprus in 1964 was ranked seventh among sulfur-producing nations and contributed about 4 percent to world production. However, domestically, copper remained the most important commodity produced.

GOVERNMENT POLICIES AND PROGRAMS

The importance of mining to the island's economy becomes apparent when it is considered that about 34 percent of the island's total export consists of minerals. This share has been declining since 1960 when it was 62 percent. Realizing the importance of mining to the economy of the country, the Government, with the assistance of the United Nations Special Fund, made arrangements for a detailed survey of the island's mineral resources.

The Forest Oil Corp., which was granted an exploration license by the Cyprus Government in 1962, has suspended its activities in Cyprus for the time being. The company was unable to continue its work after the outbreak of trouble in December 1963. Since resumption of full-time exploration, which is to cost $4.9 million over a 15-year period, was obviously problematical, the company invoked the forcé majeuré clause in its agreement that allowed it to suspend all activities. The company can resume its operations in Cyprus in the future.

PRODUCTION

By and large, the mineral production of Cyprus in 1964 showed a substantial decrease over the 1963 level. Output of copper, crude gypsum, and calcined gypsum decreased by approximately half, and the production of chromite, asbestos, and cement declined 40 percent, 33 percent, and 5 percent, respectively. No salt production was reported in 1964 because salt is collected from the salt lakes only every other year.

---

[1] Foreign minerals specialist, Division of International Activities.

[2] The unit of currency is the Cyprus pound; 0.357143 unit of a pound equals US$1.00.

Internal disturbances that began in late December 1963 and continued throughout 1964 may have affected the 1964 mineral production. Preliminary reports indicate that the mines of Cyprus Mines Corporation, a U.S.-owned company with headquarters in Los Angeles, may substantially increase copper production in 1965.

TABLE 1.—Cyprus: Production of metals and minerals

(Metric tons)

Commodity	1960	1961	1962	1963	1964 [p]
Metals:					
Chromite	16,233	17,981	6,538	[r] 5,000	3,000
Copper [1]	32,200	25,800	22,900	[r] 26,000	13,000
Nonmetals:					
Asbestos	21,152	14,703	20,313	[r] 18,000	12,000
Cement	86,430	96,100	96,720	[r] 84,000	[e] 80,000
Gypsum:					
Crude	112,909	104,480	104,401	100,000	[e] 45,000
Calcined	9,190	25,000	30,949	52,000	30,000
Mineral pigments:					
Terre verte	9	4	10	10	10
Umber	4,250	4,320	6,727	6,000	[e] 6,000
Yellow ocher	297	303	610	500	[e] 400
Pyrites (sulfur content)	445,900	402,000	394,700	444,000	578,000
Salt	NA	2,088	5,651	[r] 7,000	NA

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Estimated content of concentrates, cement, copper, and cupreous pyrite; excluding content in iron pyrites, which may or may not be recovered.

TRADE

Political disturbances that began on December 22, 1963, disrupted the economic life of Cyprus in 1964. Two periods since the beginning of the strife can be distinguished. During the early period, which lasted for about 3 months, the economy stagnated due to lack of security. In the subsequent period, security improved slightly and Government and business resumed those business undertakings which could be started.

The mining industry was greatly affected by these disturbances; most of the mines were closed down until the middle of April. During the first quarter of 1964 exports of minerals, mainly from stocks, fell to $3.4 million compared with $19.3 million during the first quarter of 1963.

During the first quarter of 1964 exports and imports were lower by 17 percent and 19 percent, respectively, compared with the corresponding period of 1963. Capital goods, machinery and equipment, motor vehicles, iron and steel, and petroleum products were the chief imports, totaling about $734 million in 1963. Exports did not keep pace with imports. Minerals and agricultural products combined account for over 80 percent of total exports, approximately $62 million. The United Kingdom and West Germany were the principal destinations.

TABLE 2.—Cyprus: Exports of metals and minerals

(Metric tons)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Chromite	9,679	406	All to West Germany.
Copper ore and concentrates	94,380	110,197	West Germany 90,436; Spain 15,697; Belgium 4,064.
Copper cement	1,694	3,146	All to Spain.
Cupreous pyrite	107,317	105,515	Italy 75,837; West Germany 29,679.
Manganese		106	All to United Kingdom.
Nonmetals:			
Asbestos, crude	14,102	13,676	Denmark 5,505; Thailand 3,002; Sweden 2,087.
Gypsum:			
Crude	35,662	55,150	Taiwan 20,501; Lebanon 26,471; Philippines 8,178.
Calcined	1,950	1,642	Lebanon 1,238; Sudan 274.
Mineral pigments:			
Ocher	533	276	United States 195; Denmark 32.
Terre verte	6	6	United Kingdom 2; Italy 2.
Umber:			
Crude	472	544	United Kingdom 340.
Burnt	3,945	3,799	United States 1,936; United Kingdom 1,365.
Pyrites	802,700	760,804	Italy 296,420; United Kingdom 148,133.

TABLE 3.—Cyprus: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys	184	272	United Kingdom 101; Greece 53.
Copper, including brass	99	70	United Kingdom 33; Yugoslavia 22.
Gold troy ounces	7,182	10,219	United Kingdom 10,122.
Iron and steel:			
Pig iron	51	202	United Kingdom 152; U.S.S.R. 50.
Ferroalloys	10	1	All from West Germany.
Ingots, blooms, billets, castings and forgings	858	1,084	United Kingdom 532; Italy 199.
Lead and alloys	167	64	United Kingdom 59.
Nickel and alloys	5	1	All from West Germany.
Tin and alloys	461	488	Mainly from United Kingdom.
Zinc and alloys	59	47	Australia 30.
Nonmetals:			
Asbestos	4,073	4,658	Yugoslavia 2,717; Czechoslovakia 1,678.
Building stone:			
Unworked value, U.S. dollars	20,000	23,000	Greece 6,950.
Worked do	10,578	5,511	Italy 4,450.
Cement	62,467	87,758	U.S.S.R. 24,755; Lebanon 36,936.
Clay	88	170	United Kingdom 80; Greece 80.
Fertilizers:			
Nitrogenous	31,590	43,288	Italy 14,955; Austria 10,894.
Phosphatic	33,124	33,866	Lebanon 12,368; Portugal 11,333.
Potassic	16,421	26,277	Italy 12,240; Portugal 8,066.
Pumice	822		
Salt	215	274	Mainly from United Kingdom 243.
Sulfur, refined	1,734	1,858	Italy 1,298.
Other (lime, feldspar, gypsum)	9	13	United Kingdom 8.
Mineral fuels:			
Coal	83	288	Mainly from West Germany.
Coke	242	554	Mainly from West Germany.
Petroleum refinery products:			
Motor gasoline thousand barrels	431	492	Italy 261; France 158.
Aviation gasoline do	27	33	Mainly from Netherlands.
Kerosine do	197	228	Italy 98; Netherlands 97.
Jet fuel do	28	230	France 138; Aden 54.
White spirits and solvents do	2	3	All from Netherlands
Gas oil do	422	373	Italy 291; Netherlands 82.
Fuel oils including diesel do	666	909	Italy 405; Turkey 209.
Liquefied petroleum gas do	36	51	Greece 31; Italy 13.
Lubricating oil and grease do	25	33	United Kingdom 22.
Other, including pitch, wax, and asphalt thousand barrels	14	103	Spain 66; United Kingdom 18.

COMMODITY REVIEW

Chromite.—Chromite mining by the Cyprus Chrome Co. Ltd. was at its lowest production level in years. The reported tonnage for 1964 consisted mainly of reconcentration of the old tailings but includes some new output. Apparently because of a workers' strike and inability to compete in the world market, most of the companies decided to rework old tailings. No exploration was reported in 1964.

Copper and Pyrite.—Modification of a flotation concentrator and construction of a new plant for the recovery of copper and pyrite from old tailings affected the copper and pyrite output in Cyprus during 1964. Net income of Cyprus Mines Corp. after taxes for first 9 months of 1964 was $5,795,000 compared with $6,374,000 during the corresponding period in 1963. Although earnings and tonnage produced from this source were considerably lower than in 1963, the higher prices for copper that prevailed in 1964 were a compensating factor.

SOURCE MATERIAL

Information on mineral development of the Republic of Cyprus was obtained from foreign service dispatches of the U.S. Embassy in Nicosia and the annual economic report of the Cyprus Government. The country's trade data were gathered from the official publication, "Statistics Imports and Exports," issued by the Department of Statistics and Research, Ministry of Finance.

The Mineral Industry of Iran

By E. Shekarchi[1]

◆

PETROLEUM remained both the predominant sector of the Iranian mineral industry and the largest contributor to the foreign exchange of the nation in 1964. Iran's petroleum production ranked third after that of Kuwait and Saudi Arabia in the Near East and sixth among world petroleum producers. Other mineral industries, such as chromite, lead-zinc, and raw building material, although not comparable to petroleum, contributed to the domestic economy and foreign exchange earnings of the nation in 1964.

Total manpower employed by the Consortium (Iranian Oil Exploration and Producing Co. and the Iranian Oil Refining Co.), the National Iranian Oil Co. (NIOC), Société Iran-Italienne des Petroles (SIRIP), and Iranian Pan-American Oil Co. (IPAC), including staff members, contractors, and employees, was estimated at 42,500 in 1964, approximately the same as in 1963. Although official estimates of manpower in metallic, nonmetallic, and solid-fuels sectors were not available, it is believed that about 5,000 employees were engaged in them.

In 1964, the official cost of living index showed an increase of 4 percent over that of 1963, but this was largely attributed to higher food prices that were the result of the severe winter. The per capita gross national product was $221[2] in 1964 compared with $216 in 1963. Total gross national product (GNP), based on 1962 prices, was $5,030 million in 1964.

Several important and fundamental steps that marked a turning point in the history of petroleum industry were taken by officials of NIOC and the Iranian Government.

The Governments of Iran and India in 1964 agreed to the construction of a 50,000-barrel-per-day oil refinery in Madras, India, at an estimated cost of $30 million. Of this cost, 51 percent will be financed by the Indian Government and 49 percent by the National Iranian Oil Co. Crude oil will be supplied to the refinery from the new oilfields discovered in the Persian Gulf.

Also in 1964, the National Iranian Oil Co. signed a final agreement with Fluor International and three German firms to build a projected 80,000-barrel-per-day refinery at Tehran. It was reported that the Fluor would handle design, construction, and supervision, while the German companies—Mannesmann, Phoenix-Rheinerohr, and Stahlunion—would provide the equipment. Officials of NIOC reported that actual construction of the $60 million plant will start in November 1965, with its completion date expected 30 months later.

---

[1] Foreign minerals specialist, Division of International Activities.
[2] US$1 equals 75.75 Iranian rials.

The Plan Organization and the French Oil Institute signed an agreement in February 1964, for the establishment of a petrochemical industry in Iran. The proposed projects were estimated to cost $116 million and were to include facilities for producing synthetic rubber, plastics, detergents, and synthetic fibers. The project is to be financed partly by the Plan Organization and partly by drawing from the recently announced French credit of $61 million. (This credit is not solely for the petrochemical plant.) After a feasibility study, actual construction is expected within 48 months. Under the agreement, Iranian personnel will be trained to run the plant by the time it is completed. The plant reportedly will be at Ahwaz where surplus gas is available. Electricity will be supplied from the nearby Pahlavi (Dez) dam.

In order to solve the country's problems of petroleum supply and distribution, the NIOC appointed a French company as consultant for the construction of a 756-kilometer pipeline from Ahwaz to the projected refinery at Tehran. Plans call for a pipeline of 20-inch diameter for 120 kilometers and a 16-inch-diameter pipeline for 636 kilometers with a total capacity of over 80,000 barrels per day. The pipeline was to have eight pumping stations, the first three of which were due to be completed by the beginning of 1966.

To encourage expansion and exploration of mining activities in the country, a decree was passed by the Council of Ministers in September 1963, authorizing the grant of export premiums to exporters amounting to 20 percent of the f.o.b. price of chromite and lesser percentages for other commodities. Under the decree, zinc exporters received a premium of 10 percent. However, in September 1964, it was announced that export subsidies would be reduced to 15 percent on chromite, to 10 percent on lead, and that subsidies on zinc would be eliminated.

In 1964 the British firm of Rio-Tinto began zinc-lead operations in Yazd, central Iran. To transport the ore to the Persian Gulf coast, the Government of Iran was said to be considering the building of a 500-kilometer railway from Yazd to a new port near Bandar Abbas on the Persian Gulf.

The Government of Iran signed a contract with the U.S. firm of Pomeroy (Morrison Knudsen and Hawaiian Dredging) for the construction of the Bandar Abbas port. The estimated cost of $24 million was to be obtained by a $15-million loan from the United States. (Agency for International Development) (AID) together with funds from the Plan Organization of Iran. The proposed port would be 7 kilometers west-northwest of present Bandar Abbas.

On June 10, 1964, the World Bank made a loan of $18.5 million to Iran for the improvement of about 700 kilometers of high-priority roads. The project is scheduled for completion in 1967 at a total estimated cost of $44.2 million.

PRODUCTION

The year 1964 was marked by record production levels for many Iranian mineral products. The petroleum industry increased its crude output by 15 percent over that of 1963, setting a new record in the history of petroleum production. Refinery throughput increased by approximately 4 percent over that of 1963.

Chromite output continued a gradual increase which began in 1957. Although production of chromite by other countries showed no significant increase, Iran, a relative newcomer to the world market, doubled production over the 1960 level. Copper, iron, and manganese showed no remarkable increase but zinc and lead production increased about 50 percent.

Other important increases were recorded in nonmetals; barite production increased almost 260 percent; cement output increased 34 percent (a record production), salt production almost doubled, and there was a fourfold increase in sulfur production for the year.

TABLE 1.—Iran: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Chromite	68,000	[r] 74,000	[r] 90,000	100,000	120,000
Copper ore (3 to 4 percent copper)	12,000	5,000	5,000	5,200	5,200
Iron ore .... thousand tons	58	42	8	[r] 20	21
Lead:					
Content of concentrate	15,000	15,000	10,000	10,000	[e] 15,000
Ingots (smelter output)	1,160	1,304	400	[e] 500	NA
Manganese ore	7,700	2,100	[r] 1,000	3,000	[r] [e] 3,000
Zinc, content of concentrate	8,500	13,500	7,500	[e] 10,000	[e] 15,000
Nonmetals:					
Barite	13,000	19,000	15,000	20,000	[e] [r] 72,000
Cement, hydraulic .... thousand tons	797	745	[e] 745	[e] 745	[e] [r] 1,000
Ocher	9,800	8,330	8,000	8,700	9,000
Salt .... thousand tons	130	145	269	345	[e] 345
Sulfur [e]	20,000	20,000	15,000	20,000	105,000
Mineral fuels:					
Coal .... thousand tons	230	200	200	[e] 200	[e] 200
Coke .... do	20	20	[e] 20	[e] 20	[e] 20
Natural gas .... million cubic feet	264,354	296,646	324,281	364,928	[e] 350,000
Petroleum:					
Crude .... thousand 42-gallon barrels	385,749	431,654	481,903	538,098	618,731
Refinery products: [1]					
Gasoline .... do	25,161	18,946	22,630	23,629	22,515
Kerosine .... do	15,416	13,811	15,441	16,139	18,507
Jet fuel .... do	4,168	4,248	5,787	7,286	7,497
Distillate fuel oil .... do	20,704	19,263	22,870	22,262	21,094
Residual fuel oil .... do	50,245	45,928	52,032	60,611	66,229
Liquefied petroleum gas .... do	43	64	81	68	73
Lubricating oil .... do	126	133	135	178	247
Bitumen .... do	1,615	1,813	1,424	1,078	1,227
Other .... do	2,936	2,680	3,294	1,190	1,412
Total .... do	120,414	106,886	123,694	[r] 132,441	138,801

[e] Estimate.
[r] Revised.
NA Not available.

[1] Output of Abadan and Kermanshah refineries only; excludes output of Masjed-e Soleyman, Naft-e Shah, Alborz, and other topping plants some small part of which may have been sold.

TRADE [3]

Crude petroleum and refinery products contributed the largest share of foreign exchange earned by Iran's mineral products in 1964. Total exports and deliveries to Abadan refinery on the account of the trading companies amounted to 570 million barrels during 1964, an increase of about 14 percent compared with those of 1963. Total gross value of petroleum export in 1963 was approximately $898 million.

Chromite exporters experienced an increase of about 9 percent in 1962–63, a sizable contribution to the world chromite market. Exports of iron ore and zinc ore decreased 76 percent and 30 percent, respectively, while lead ore and concentrate exports climbed to a new high of 43 percent over the 1961–62 level.

In the nonmetals sector, natural asphalt exports dropped 93 percent in 1962–63 compared with the 1961–62 level; whereas building and crushed stone exports increased about 100 percent and cement experienced a 48-percent increase in 1962–63 over the 1961–62 export level. A remarkable increase was shown in coal and lignite exports in 1962–63; they almost tripled those of 1961–62.

Total export of metals and minerals, excluding petroleum, amounted to approximately $4.3 million in 1962–63.

Iran's mineral industry product imports in 1962–63 consisted largely of iron and steel valued at approximately $55 million, or 10 percent of net value of all imports to the country. Imports of copper alloys and semimanufactures and phosphatic fertilizer almost doubled in volume during 1962–63, while imports of other commodities remained at the same level as the 1961–62 imports. A consistently large trade deficit (excluding petroleum and products) was more than met by earnings from the oil industry in 1962–63.

---

[3] Except in the case of petroleum, for which data are available for Gregorian calendar years, information given in this section is on the basis of Iranian calendar years, which have been indicated by hyphenated years (i.e., 1962–63). The Iranian calendar year begins on March 21.

TABLE 2.—Iran: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961–62 [1]	1962–63 [1]	Principal destinations, 1962–63 [1]
Metals:			
Chromite	67,669	73,758	France 21.436; Netherlands 14,662; Italy 11,152.
Iron and steel:			
Iron ore	[r] 21,549	4,900	Czechoslovakia 2,500; West Germany 2,400.
Iron and steel scrap	6,224	716	Japan 700; Afghanistan 16.
Other	----------	337	Kuwait 128; Dubai 72; Afghanistan 67.
Lead and alloys:			
Ore and concentrate	21,274	30,527	U.S.S.R. 21,849; Belgium 6,178; United Kingdom 2,500.
Ingots	991	507	All to U.S.S.R.
Manganese ore	1,270	250	All to Italy.
Zinc ore	21,559	15,210	Belgium 11,037; U.S.S.R. 1,876; Netherlands 1,297.
Other metals and ores	1,934	68	Afghanistan 42; Iraq 18.
Nonmetals:			
Asphalt (natural)	97,299	5,833	Thailand 2,350; Kenya 1,895; Australia 1,487.
Building and crushed stone	6,244	12,259	Kuwait 6,915; Italy 4,146; Oman 997.
Cement	531	785	All to Afghanistan.
Clays	63	2,686	Kuwait 2,230; Oman 454.
Gypsum	2,732	4,161	Kuwait 3,669; Oman 366; Dubai 123.
Ocher, chalk, and earth colors	7,275	5,874	India 2,307; United Kingdom 2,100; France 1,000.
Salt	1,774	1,986	Oman 1,338; Kuwait 598.
Sand and ground quartz	743	86	Oman 80; Dubai 6.
Sulfur	72	87	Iraq 70; Kuwait 13.
Other, including turquoise	[r] 260	158	Kuwait 150; Dubai 3; United States 5.
Mineral fuels:			
Coal and lignite	268	617	Iraq 328; Kuwait 289.
Petroleum:			
Crude thousand 42-gallons barrels	310,118	335,428	United Kingdom 63,159; West Germany 45,033; Japan 34,580.
Refinery products:			
Gasoline [2] do	20,195	22,774	Republic of South Africa 3,549; India 2,270; Mozambique 1,334.
Kerosine do	6,733	6,275	India 2,379; Pakistan 782; Ceylon 460.
Gas oil do	8,200	10,777	Pakistan 1,689; India 1,530; United Kingdom 1,513.
Diesel oil do	4,371	4,226	Pakistan 697; Japan 481; Kenya 467.
Fuel oil do	43,508	44,721	United Kingdom 7,798: Japan 6,495; Pakistan 3,571.
Asphalt	965	601	India 101; Pakistan 51; Thailand 46.
Total do	83,972	89,734	

---

[r] Revised.

[1] Iranian calendar year beginning March 21.

[2] Includes aviation gasoline, jet fuel, and others

TABLE 3.—Iran: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961-62 [1]	1962-63 [1]	Principal sources 1962-63 [1]
Metals:			
Aluminum and alloys:			
Ingots	1,727	1,859	Canada 954; United States 284; U.S.S.R. 100.
Semimanufactures	1,138	1,796	United Kindgom 518; Japan 380; Italy 219.
Antimony	3	8	West Germany 6; Czechoslovakia 2.
Copper and alloys:			
Ingots	362	409	United Kindgom 313; Republic of South Africa 56.
Semimanufactures	3,736	7,185	France 1,321; United Kingdom 904; Italy 813.
Gold ... troy ounces	417,059	[2] 1,993	Italy 900; Kuwait 804.
Iron and steel:			
Cast iron and ferroalloys	736	6,708	Italy 4,000; U.S.S.R. 1,856; West Germany 835.
Scrap	2,628	2,935	Kuwait 1,592; Oman 544; United Kingdom 339.
Ingots	354	473	Austria 462; West Germany 5.
Semimanufactures	293,959	330,417	West Germany 89,491; Belgium 69,070; United Kingdom 42,444.
Lead:			
Ingots	44	38	United Kingdom 22; Denmark 9.
Lead oxide	NA	219	West Germany 88; Denmark 64; United Kingdom 31.
Semimanufactures	34	194	United Kingdom 111; West Germany 49.
Nickel, all forms	395	329	Italy 245; West Germany 78.
Platinum ... troy ounces	900	32	All from West Germany.
Silver ... do	100,150	39,620	Lebanon 19,300; Israel 10,546.
Tin and alloys:			
Ingots	328	213	Malaya 156; Singapore 15.
Semimanufactures	85	154	United Kingdom 117; West Germany 29.
Zinc and alloys:			
Zinc oxides	NA	298	Belgium 106; Netherlands 75; West Germany 43.
Semimanufactures	154	881	United Kingdom 344; Republic of South Africa 300; Belgium 122.
Nonmetals:			
Abrasives	19	84	West Germany 28; United Kingdom 16.
Asbestos	804	1,872	Italy 597; Belgium 595; United Kingdom 367.
Barite and witherite	211	230	United States 167; U.S.S.R. 50.
Building and crushed stone	547	579	United Kingdom 151; Austria 108.
Cement ... thousand tons	45	26	United Kingdom 11; West Germany 5; Italy 2.
Clays	5,364	[3] 21,933	Italy 10,378; United Kingdom 5,214; Netherlands 1,138.
Fertilizers:			
Phosphatic	r 9,675	17,293	Tunisia 8,200; Belgium 4,046; U.S.S.R. 1,459.
Potassic	r 3,191	715	All from Italy.
Nitrogenous	r 9,104	5,288	France 3,386; Italy 585; U.S.S.R. 367.
Other	r 23,782	22,814	West Germany 15,000; U.S.S.R. 1,520.
Graphite	15	43	West Germany 35; Yugoslavia 8.
Mica	714	1,110	West Germany 622; United States 196.
Salt	100	121	U.S.S.R. 83; United Kingdom 28.
Sulfur	5,230	15,745	France 15,666; Belgium 30.
Talc	21	462	France 182; Luxembourg 110; United States 45.
Mineral fuels:			
Anthracite coal and coke	8	28	All from United Kingdom.
Peat and lignite	----------	24	All from United Kingdom.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	3		
Diesel oil ... do	----------	1	All from United States.
Lubricating oils ... do	181	178	United States 129; United Kingdom 20.
Asphalt	3	1	All from West Germany.

[1] Iranian calendar year beginning March 21.
[2] Jewelry gold not included.
[3] Includes kaolin, fire clay, and drilling mud.

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Chromite.—Most of the 120,000 metric tons of 48-percent chromite produced in 1964 was from the southeastern mines. Mines in north-central Iran remained inactive and others had limited production. Total 1964 production was 20 percent greater than that of 1963. The roadbuilding program initiated in 1963 from Bandar Abbas to the Esfandageh and Faryah mining concessions continued through 1964. Completion of this modern road will greatly facilitate ore transportation in southeast Iran and eventually will place Iranian chromite in a better competitive position in world markets.

Copper.—Copper mining near Anarak, the only producing district, continued at the same production level as in 1963.

The Economic Department of the Ministry of Economy announced in the latter part of 1964 that the Plan Organization approved mineral exploration projects for copper deposits in Sistan and Baluchistan of southeastern Iran, in the copper districts of Montoftan and Kirman of southeastern Iran and in the copper deposits in Azerbaijan of northwestern Iran.

Iron and Steel.—All government organizations concerned with mineral exploration examined the possibility of commercial iron ore exploitation in Iran. Emphasis was particularly on such deposits as Shamsabad, south of Arak; Choghart, 10 kilometers northeast of Bafqu; Narigan, 35 kilometers east of Bafqu; the deposits on the east and north of Semnan; and Khan-Gharash, southwest of Zanjan. Although detailed information on the results of the studies were not available, it seemed highly possible that there were ample reserves of iron ore in Iran to warrant the initiation of a moderate-size integrated domestic steel industry. Representatives of leading European and United States steel companies visited Iran in 1964 to discuss plans for the construction of a steelworks. Apparently Demag Co. of the Federal Republic of Germany recommended construction of a plant with a 250,000-ton annual capacity based on an electric steelmaking process, while a French company suggested a plant with an annual capacity of 500,000 tons. It was also reported that a Czechoslovakian firm submitted a proposal for a plant with a different annual capacity. Government officials reportedly were studying these proposals at yearend.

Most of Iran's steel requirements were met by imports in 1963–64. Semimanufactures for use in the building industry were the chief category with imports of 330,417 tons.

Lead and Zinc.—The opening of the Yazd venture of the British firm Rio-Tinto, coupled with a slight increase in the world market price for zinc, directly affected many lead-zinc districts in Iran during 1964. Under the technical assistance program of the U.S. Agency for International Development (AID), in cooperation with the Iranian Ministry of Economy, a drilling program was initiated in four areas in 1962. After drilling a total of 6,200 meters, a reserve of 35 million metric tons of ore containing 4 percent lead and 11 percent zinc was estimated in 1964. Some of the discoveries contain 2 to 3 ounces per ton of silver and important amounts of cadmium. Some of the important discoveries were in Angouran lead-zinc district, Koushk deposits and Mehdi-Abad lead-zinc district.

According to reports of the Ministry of Economy, 78,500 tons of 20 to 50 percent zinc concentrate and 62,300 tons of 30 to 60 percent lead concentrate were produced in 1964.

NONMETALS

Cement.—For the past 6 years, Iran's consumption of cement has ranged from 850,000 to 1 million tons a year, largely produced locally. At yearend, there were eight cement plants situated in various industrial centers of the country; these produce most of the country's requirements. Reported total capacity was slightly over 1 million tons of cement, about equal to the output in 1964.

Gypsum.—Iran's important gypsum mines are along the Zagros range and in the Alborz chain that extends from east to west in the northern part of Iran. Gypsum production, not of world significance, continued to be used largely in the cement industry and as a construction material. Output exceeded 1 million tons in 1964.

Phosphate Rock.—In 1964, an Iranian geological survey team reported a phosphate rock discovery in Eocene strata that extends over 500 kilometers along the eastern Zagros range, starting from Shiraz toward Hemadan. The phosphate-containing unit averages only 10 centimeters in thickness. No information regarding reserves or grade of the phosphate unit was available.

MINERAL FUELS

Petroleum.—*Production.*—Net Iranian crude oil production during 1964 reached a record of nearly 619 million barrels, an increase of 15 percent over that of 1963. Of this total, the 10 producing fields of the Consortium accounted for nearly 606 million barrels.

From the NIOC-operated Naft-e Shah oilfield, total crude oil production was nearly 3.2 million barrels for 1964, an increase of 41 percent over the 1963 production. Production of crude petroleum from Alborz oilfield was drastically reduced from 3 million barrels in 1963 to about 100 thousand barrels in 1964.

Crude petroleum production of Société Iran-Italienne des Petroles (SIRIP) from the Bahregansar offshore oilfield in 1964 was 9.1 million barrels.

Iranian Pan-American Oil Co. (IPAC) in late 1964 started production from Iran's second offshore field, Darius, near Kharg Island in the Persian Gulf. There are 7 producing wells in this field, of which it has been reported four have a combined production of over 40,000 barrels per day. Output totaled 1.1 million barrels in 1964.

The Iranian Oil Exploration and Producing Co. (IOEPC) commenced crude oil production from two new oilfields for export through recently commissioned production facilities. Karanj fields, about 23 kilometers northeast of Agha Jari oilfields, went on stream on November 14, 1964, at a rate of 38,000 barrels per day, and Bibi Hakimeh field, approximately 33 kilometers southwest of Gachsaran oilfield, went on stream in November 1964, at an initial rate of about 5,000 barrels per day. Output of the latter was expected to be increased to an average of 40,000 barrels per day.

IPAC continued improvements on Kharg Island in 1964 and reportedly the storage capacity of IPAC on the island was 750,000 barrels and would be eventually elevated to 1 million barrels.

Exploration.—The exploration team of IOEPC discovered a new oilfield in southern Iran, the 10th in recent years. The new field, called Faris, is 31 kilometers from Agha Jari. At Faris, petroleum was found in the Asmari limestone at 8,806 feet. Also 33 kilometers southeast of Agha Jari at Rag-e Safid, the team made another new discovery, well No. 2, which was drilled to 11,859 feet and at test had a flow of about 4,000 barrels per day from the base of Asmari limestone.

Refining.—Crude oil processed in the Abadan refinery during 1964 totaled almost 136 million barrels, an increase of 2.3 percent compared with that of 1963.

Neither NIOC nor the Iranian Oil Refining Co. (IORC) of the Consortium regularly publishes detailed information concerning output by type of products from the topping plants and refineries at Kermanshah, Naft-e Shah, Alborz, and Masjid-e Soleyman. However, through the courtesy of the NIOC and the Consortium, the following figures for 1963 were provided for publication:

Commodity	Thousand 42-gallon barrels			
	Kermanshah	Naft-e Shah	Alborz	Masjed-e Soleyman
Crude processed	1,356	1,667	938	14,273
Refinery products:				
Gasoline	393	410	NA	NA
Fuel oil	602	724	NA	NA
Gas oil	111	214	NA	NA
Kerosine	250	319	NA	NA
Total products	1,356	1,667	938	4,724

NA Not available.

Reportedly the total products from Alborz topping plant included approximately 187,000 barrels of naphtha (20 percent of total) and 751,000 barrels of fuel oil (80 percent). Apparently, the Masjed-e Soleyman refinery delivered 4,692,000 barrels of residual fuel oil to the NIOC and 32,000 barrels of residual fuel oil was used by the producing plant. Of the total crude oil processed, 9,549,000 barrels were delivered to the Abadan refinery for further processing.

Pipelines.—The completion of the second 30-inch 43-kilometer submarine pipeline between Ganeveh and Kharg Island was announced by the Consortium in 1964. With this line, the crude oil carrying capacity to Kharg Island was increased to 500,000 barrels per day. The pipe was laid under the water off the western coast of Kharg by the towed-section method rather than the continuous-pull method as used on the first Ganaveh-Kharg submarine line.

In the near future, crude oil from all the Consortium's fields is expected to be supplied through Kharg. A 42-inch, 190-kilometer pipeline from Agha Jari to Kharg was proposed during 1964, but no action was taken.

The extension of the Tehran-Qazvin products pipeline north to Rasht near the Caspian Sea was completed. Total length of the line is about 330 kilometers, of which the section from Tehran-Qazvin is 8-inch and the Qazvin-Rasht section is 6-inch.

Natural Gas.—IOEPC discovered natural gas in the Rag-e-Safid field in 1964. Reportedly, the company intended to deepen No. 2 well so as to evaluate the deeper horizons in Asmari limestone. Also, in April 1964 IOEPC announced the completion of the first well drilled at the Marun field for natural gas. The well was started in November 1963 and found high pressure gas at 7,621 feet. The Marun structure is 33 kilometers southwest of Ram Hormuz in Khuzestan.

National Iranian Oil Co. well, Gorgan No. 3A in northeast Iran near the Caspian coast, found natural gas at 6,676 feet with an estimated yield of 3 to 5 million cubic feet per day. This well reportedly is near Gorgan No. 3 well which found gas in 1960.

SOURCE MATERIALS

Information on activity during 1964 has been gleaned from dispatches of the U.S. Embassy in Tehran and supplemented by the partial coverage of the technical press and NIOC's News Letter. The statistical data was taken mainly from official annual and interim publications of the Iranian Government.

The Mineral Industry of Iraq

By James A. West[1]

◆

THE petroleum industry remained the only highly developed mineral industry of Iraq in 1964. Cement and salt continued to be produced in quantities sufficient to meet internal demand, and small quantities of cement were exported. The country also produced minor building materials and small quantities of natural bitumen, gypsum, and clays.

In 1964, crude oil production averaged a record 1.254 million barrels per day, an increase of almost 9 percent over 1963 output. Crude oil production was about 4.5 percent of the total world output and 16 percent of the Middle East output. The oil industry annually accounts for about 97 percent of the value of all minerals produced and nearly half of the gross national product, estimated at $1,566 million in 1963. Petroleum provided more than 90 percent of foreign exchange earnings and was the major source of government revenues, which amounted to a record $353 million in 1964.

In 1963, petroleum exports were valued at $728 million while all imports were estimated at $319 million. The petroleum earnings offset consistent foreign exchange deficits in the other sectors of Iraq's economy and accounts for large trade surpluses.

The petroleum industry employed about 2,000 persons, or about 20 percent of the total industrial labor force. An estimated 2,300 people were employed at cement plants.

GOVERNMENT POLICIES AND PROGRAMS

The most important policy affecting industry in Iraq during 1964 was the nationalization on July 14 of all banks, insurance companies, and about 30 trading and industrial companies. The nationalization applied to 27 companies comprising 34 percent of Iraqi industry, exclusive of oil companies. Four private cement companies were included.

On February 8, 1964, the Government of Iraq promulgated Law 11 which provided for the establishment of the Iraqi National Oil Co. (INOC). The law provides for a fully Government-owned company to operate in all phases of the oil industry. INOC was established officially on March 8, 1964. On September 7, INOC submitted applications for concessionary areas except those allocated to the Iraq Petroleum Companies group (IPC group), composed of Iraq Petroleum Co., Mosul Petroleum Co., and Basrah Petroleum Co.

---

[1] Chief Near East-South Asia specialist ,Division of International Activities.

under Law 80 of December 1961 which withdrew 99.5 percent of concession areas long held by IPC companies. Through yearend 1964, the IPC group had not accepted the legality of the Law 80 action and has limited its operations to the developed producing areas since 1961. INOC announced that it planned to develop certain concession areas by itself and that other areas would be contracted out to international companies for development.

The 1963 agreement between IPC group and the Government on cargo and port taxes at Basra was extended for another year to March 31, 1965. This agreement was largely responsible for increased oil liftings from this port and has contributed significantly to national oil output since 1963.

PRODUCTION

There were no significant changes in the production of mineral commodities other than crude oil in 1964. Petroleum production in 1964 was about 9 percent greater than in 1963. Nearly all increased output was from the Zubair and Rumaila fields of southeastern Iraq.

TABLE 1.—Iraq: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Nonmetals:					
Cement	617,548	936,994	920,702	[1] 901,067	1,074,745
Salt	36,710	36,956	38,450	[e] 40,000	[e] 40,000
Mineral fuels: Petroleum:					
Crude .... thousand 42-gallon barrels	353,833	365,594	366,832	422,581	[2] 459,290
Refinery products:					
Gasoline .... do	2,067	2,230	2,394	[r] 2,315	2,374
Kerosine and jet fuel .... do	2,413	2,938	3,015	[r] 3,228	3,631
Distillate fuel oil .... do	2,945	2,906	3,034	[r] 3,110	3,950
Residual fuel oil .... do	5,730	6,900	7,044	[r] 6,796	7,685
Lubricants and other .... do	471	165	162	[e] 681	[e] 700
Asphalt .... do	NA	264	226	[e] 226	388
Liquefied petroleum gas .... do	NA	11	21	34	[e] 110
Refinery fuel and loss .... do	1,287	1,443	1,656	989	[e] 1,212

[e] Estimate. [r] Revised. NA Not available.

[1] For year Oct. 1, 1962 to Sept. 30, 1963.

[2] Includes an estimate of 2,384,000 barrels from Government-operated Naft Kaneh field

TRADE

The value of mineral exports in 1963 was $732 million or nearly 94 percent of that for all exports. Of this value, oil accounted for 99.5 percent and cement accounted for about 0.4 percent. Exports of petroleum and cement during 1963 increased over those of 1962 by 15.9 and 90.1 percent, respectively.

Iraq remained dependent on imports for all metals and most industrial minerals. Metals and minerals imported in 1963 were valued at an estimated $26 million or about 8 percent of the value of all imports. Iron and steel imports were the most important item, valued at about $20 million in 1963.

TABLE 2.—Iraq: Exports and reexports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum	52	21	Iran 15; United Kingdom 2; Lebanon 2; Syrian Arab Republic 2.
Iron and steel	1,668	481	United Kingdom 214; Syrian Arab Republic 87; West Germany 57.
Lead	203	321	Lebanon 115; United Kingdom 109.
Nonmetals:			
Cement	152,158	289,381	Kuwait 125,041; Saudi Arabia 48,768; Bahrain 35,571; Qatar 16,995; Ceylon 16,500; Pakistan 11,316.
Other (reexport only)	198	10	All to West Germany.
Mineral fuels: Petroleum:			
Crude..thousand 42-gallon barrels	347,808	403,058	France 74,014; Italy 70,630; United Kingdom 62,635; West Germany 41,845; Netherlands 37,098; Japan 18,034; Belgium 13,007; Portugal 11,470; Spain 10,024; Ireland 8,071; Turkey 7,904.
Refinery products:			
Asphalt and bitumen thousand 42-gallon barrels	95	68	Ceylon 46; Syrian Arab Republic 11; Lebanon 11.
Gasoline, distillate,[•] and other refined products...do	152	164	Bunkers except 12,000 barrels of gasoline to Saudi Arabia and 2,000 barrels other products.

[•] Estimate.

TABLE 3.—Iraq: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys:			
Ingots, including scrap	601	210	All from Canada.
Semimanufactures	1,327	1,891	U.S.S.R. 580; Lebanon 499; West Germany 252; Belgium 205; mainland China 132; United Kingdom 85.
Copper, all forms	1,907	1,077	West Germany 445; Belgium 318; United Kingdom 120; Sweden 53.
Iron and steel:			
Pig iron, powder, and scrap	489	1,219	U.S.S.R. 784; United Kingdom 204; Belgium 76.
Cast iron	20,254	15,378	United Kingdom 6,099; West Germany 5,249; U.S.S.R. 1,422; Japan 792.
Semimanufactures	210,934	137,205	Belgium 67,754; U.S.S.R. 33,392; West Germany 9,578; United Kingdom 5,865.
Lead:			
Ingots, including scrap	16	3	Malaya 2; United Kingdom 1.
Semimanufactures	23	62	Denmark 26; West Germany 17; United Kingdom 10.
Magnesium	2	2	All from United Kingdom.
Nickel	11	21	Italy 16; West Germany 4.
Tin:			
Ingots, including scrap long tons	27	123	Canada 110; Malaya 13.
Semimanufactures do	64	75	U.S.S.R. 27; United States 15; India 8; Malaya 8; United Kingdom 7; West Germany 7.
Zinc:			
Ingots, including scrap	51	61	Belgium 60.
Semimanufactures	44	44	West Germany 19; Netherlands 14; United States 6.
Other	7	13	United Kingdom 5; Netherlands 4.
Nonmetals:			
Asbestos	1,502	868	Republic of South Africa 461; Canada 365.
Barite	124	18	United States 15.
Cement	14,324	7,983	Japan 1,948; Syrian Arab Republic 1,571; Denmark 1,488; Belgium 1,464.
Chalk and earth colors	831	457	United Kingdom 258; Belgium 183.
Clay	446	473	United Kingdom 220; Greece 100; United States 51; Yugoslavia 40.
Fertilizers, mineral and chemical:			
Nitrogenous	6,895	8,471	West Germany 5,355; Netherlands 1,124 Austria 607; Italy 504.
Phosphatic and potassic	1,742	1,840	West Germany 1,731; Netherlands 106.
Gypsum and lime	291	153	All from United Kingdom.
Steatite	291	330	India 286; mainland China 25.
Stone:			
Building stone	903	1,341	Jordan 1,081; Italy 205; United Kingdom 33.
Crushed stone and sand	833	1,166	Jordan 1,006; United Kingdom 160.
Limestone and dolomite	261		
Sulfur	1,299	2,119	United States 2,017; France 51; West Germany 51.
Other	453	66	United Kingdom 31; West Germany 8; United States 8.
Mineral fuels:			
Coal and coke	1,589	1,398	West Germany 832; Iran 305; Belgium 184.
Petroleum refinery products:			
Lubricating oils 42-gallon barrels	14,553	11,130	United Kingdom 3,553; United States 2,423; West Germany 2,075.
Asphalt and bitumen do	3,848	5,320	Iran 3,575; United Kingdom 1,679.
Tar and pitch do	1,169	679	Netherlands 660.
Waxes do	1,959	2,495	India 1,063; West Germany 1,039; United States 291.
Petroleum jelly do	448	283	Netherlands 189; West Germany 94.
Gasoline do	437	723	All from Iran.

COMMODITY REVIEW

METALS

Iron and Steel.—Following lengthy negotiations during the year, a contract was signed on October 7, 1964, between Koppers International and the Government of Iraq for engineering consulting services in connection with a proposed iron and steel plant. The contract provides for feasibility studies and preliminary engineering to begin at once. The Government will evaluate the results of the basic study to determine whether to proceed with design and construction of the plant.

NONMETALS

Cement.—In 1963, Iraq's six cement plants operated at 64 percent of total rated annual capacity of 1,400,000 tons. All four private plants were nationalized by the Government on July 14, 1964.

Local consumption of cement declined in 1963–64 but production remained fairly constant because of increased exports, which amounted to about 32 percent of total production during 1963. Cement production was valued at about $12.5 million in 1963.

Ceramic Materials.—There were no developments with respect to the construction of a proposed ceramic factory at Ramadi. Proposals for the construction of a glass factory at Ramadi were being evaluated.

MINERAL FUELS

Petroleum and Natural Gas.—The reported remaining crude oil reserves of Iraq, as of January 1, 1965, were estimated to be 25 billion barrels,[2] or about 7 percent of world reserves. Natural gas reserves were estimated to be 22.5 trillion cubic feet.

Except for approximately 6,000 barrels per day of crude oil production from the Government-operated Naft Khaneb field, all crude oil was produced by the Iraq Petroleum Companies group. The Iraq Petroleum Co. (IPC) was the largest producer. The Kirkuk field maintained production of nearly 800,000 barrels per day while the Jambur and Bai Hassan fields output averaged about 55,000 barrels per day. The Ain Zalah and Butmah fields of Mosul Petroleum Co. (MPC) continued to produce about 26,000 barrels per day. Production from the southern area Rumaila and Zubair fields of Basrah Petroleum Co. (BPC) at about 359,000 barrels per day was nearly double that of 1963.

The IPC group conducted no exploration activities during 1964. All drilling operations were limited to development well drilling with only two rigs active throughout the year.

Output of refined petroleum products remained fairly constant at about 17 million barrels during 1963. Government oil agencies continued work on petroleum and natural gas processing and distribution projects.

An international tender for the construction of a 36,000-ton-per-year lubrication oil plant at the Daura refinery was announced on October 30, 1964. A contract was awarded to the Greek firm, Elbyn,

---

[2] Oil and Gas Journal. V. 62, No. 52, Dec. 28, 1964, p. 106.

Ltd. of Athens, for the construction of a grease plant at Daura. The French firm, Petrochimie S.A., was awarded an engineering design contract for construction of a $8.4 million, 630,000-barrel oil products depot at Zaafaraniya, near Baghdad. An international tender for construction of the depot was expected to be issued early in 1965. The French firm Sulfagaz was awarded a contract in February 1964 for engineering services for design of a natural gas pipeline from Kirkuk to Baghdad. Other projects under active consideration were a sulfur recovery plant at Kirkuk, a hydrogen desulfurization plant at Daura, an oil refinery at Basra, and various petrochemical projects.

The Mineral Industry of Israel

By E. Shekarchi[1]

◆

THE most significant contributions of the mineral industry to Israel's domestic economy in 1964 were the increased output of the highly mechanized potash industry in the Dead Sea area and the production of approximately 170,000 metric tons of phosphate in the Oron fields. Production of most minerals continued its upward trend. The high level of economic activity was maintained, and total gross national product, (GNP) in current prices rose to $3.1 billion.[2] The population increased by about 100,000, or 4 percent, to 2,530,000, and the number of people employed rose 5 percent in 1964.

GOVERNMENT POLICIES AND PROGRAMS

An amendment to the Israeli petroleum law was enacted by the Knesset (Israel's parliament), aimed at stimulating oil prospecting. The amendment authorizes the establishment of a Government institute to carry out basic research on oil prospecting and empowers the petroleum commissioner to provide this institute with geological and prospecting information obtained from oil drilling companies. Information given to the institute would be treated as confidential.

The Technological Advisory Board of the Ministry of Development recommended in 1964 that a countrywide aeromagnetic survey should be undertaken as part of a search for mineral deposits not disclosed by surface prospecting. The cost of this project, estimated at between $1.2 million and $1.4 million, would be shared by the Israeli Government and the U.N. Special Fund.

Basic data for the formation of a 15-year plan to develop water resources in Israel was approved by the Minister of Agriculture. According to this plan, water use in Israel will reach 1,690 million cubic meters annually by 1980. A special committee of Israelis and U.S. technical advisors appointed to review the project concluded that large-scale sea water desalting would not be economically practicable unless foreign capital can be secured on concessionary interest rates. Large desalting units were recommended in preference to a series of small units.

---

[1] Foreign minerals specialist, Division of International Activities.

[2] Where necessary, values have been converted from the Israel pound (I£) at the rate of I£1=US$0.33.

PRODUCTION

Several key commodities were marked by substantial production increases in Israel's mineral industry in 1964. Compared with 1963, production of potash increased 53 percent and bromine 28 percent. Natural gas production in 1964 was about three times that of 1963. Within the last 4 years, 1961–64, total petroleum refinery production has almost doubled.

TABLE 1.—Israel: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [e]
Metals:					
Copper [1]	5,580	6,253	5,909	7,720	8,000
Steel	41,000	62,000	80,000	82,798	83,000
Nonmetals:					
Bromine:					
Elemental	2,400	4,400	1,800	2,941	3,800
Compounds	1,378	3,300			NA
Cement	805,507	[e] 846,000	[r] 920,000	1,021,591	1,030,000
Clay, all types	24,780	38,670	39,000	27,302	30,000
Crushed stone ... cubic meters	NA	800,000	3,700,000	NA	NA
Gypsum	60,000	80,000	74,000	[r] 76,000	[r] 80,000
Lime	NA	NA	NA	NA	110,000
Marble ... cubic meters	1,500	5,000	5,500	NA	7,500
Phosphate, beneficiated	224,180	220,000	210,000	300,000	300,000
Potash (KCl)	136,000	140,000	153,000	170,000	260,000
Salt	37,220	44,000	45,000	52,000	52,000
Silica sand	24,729	26,000	34,000	50,000	40,000
Mineral fuels:					
Natural gas ... thousand cubic feet	NA	[r] 99,821	[r] 374,851	347,097	1,068,000
Peat [r] ... thousand metric tons	[e] 8	8	[e] 10	[e] 12	[e] 14
Petroleum, crude thousand 42-gallon barrels	932	1,133	1,126	1,091	1,550
Refinery products:					
Gasoline ... do	1,772	1,613	2,350	2,674	2,948
Kerosine ... do	1,387	1,592	1,833	1,884	2,333
Distillate fuel oil ... do	2,824	3,022	4,157	5,433	5,500
Residual fuel oil ... do	3,547	4,124	6,028	7,379	8,700
Other ... do	643	827	1,149	NA	478
Refinery fuel and loss ... do	552	582	817	NA	1,072
Total refinery products ... do	10,725	11,760	16,334	NA	21,031

[e] Estimate. [r] Revised. NA Not available.

[1] Metal content of cement copper exports, calculated on basis of 75 percent Cu.

TRADE

In 1963 exports totaled $350 million, compared with $279 million in 1962. The diamond-cutting industry, whose entire output is exported, attained third place in world trade (after Belgium and West Germany). The gross value of diamond exports amounted to $116 million in 1963, representing 33 percent of total exports in comparison with $89 million in 1962. Most of the increase in diamond export value in 1963 may be attributed to a 28-percent increase in quantity, but the average price rose almost 2 percent. Exports of metal products were up by $6 million while petroleum products went up by $4 million. Mining and quarrying contributed 18 percent of exports in 1963, while nonmetallic mineral products (excluding diamond) contributed only 5 percent.

Gross imports in 1963 totaled $673 million, a rise of $37 million over the 1962 figure. The largest rise in 1963 imports was in crude diamond, whose value rose by $28 million, and in the iron and steel group, an increase of $23 million. Imports of petroleum and its products increased in 1963 by $5 million.

Although countries of destination and origin are not shown in tables 2 and 3, Israel's foreign trade was conducted principally with the United States, the United Kingdom, and the European Economic Community.

TABLE 2.—Israel: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:		
Aluminum, all forms	1,887	1,663
Copper, all forms	1,265	12,908
Iron and steel:		
Scrap	1,384	1,218
Semimanufactures	6,101	11,568
Lead, all forms	7	458
Zinc, all forms	------------	778
Nonmetals:		
Abrasives	86	14
Bromine and bromine compounds	2,191	995
Cement	168,562	116,246
Clay	9,182	6,943
Diamonds:		
Cut or polished ... carats	975,576	1,152,787
Industrial ... do	96,284	NA
Fertilizers:		
Nitric	136,685	177,465
Phosphatic	2,998	327
Potassic	NA	9,017
Others	133,687	164,231
Stone, building and ornamental	455	266
Mineral fuels:		
Distilled fuel oil (Solar) ... thousand 42-gallon barrels	1,036	1,046
Kerosine ... do	21	21
Benzine ... do	440	452
Bitumen and natural asphalt ... do	2	34
Total ... do	1,499	1,553

NA Not available.

TABLE 3.—Israel: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:		
Aluminum:		
Unwrought	4,999	4,500
Semimanufactures	2,095	1,306
Cadmium (anodes)	5	6
Copper:		
Unwrought, including alloys	1,461	1,848
Semimanufactures, including alloys	6,974	6,015
Gold:		
Unwrought ... troy ounces	6,302	31,797
Semimanufactures ... do	105,326	23
Iron and steel:		
Iron ore	14,730	NA
Pig iron	18,532	20,173
Scrap and others	5,956	6,455
Ferromanganese and spiegeleisen	3,817	5,084
Other ferroalloys	725	455
Semimanufactures:		
Alloy and high-carbon steel	12,120	14,829
Alloy and low-carbon steel	24,142	29,957
Others	271,173	34,330

See footnotes at end of table.

TABLE 3.—Israel: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals—Continued		
Lead:		
Unwrought	1,336	918
Semimanufactures	102	355
Magnesium, all forms	36	19
Manganese ore	1,061	NA
Nickel, all forms	82	89
Platinum, unwrought and partly worked ... troy ounces	39,224	2,765
Silver:		
Unwrought ... do	547	193
Semimanufactures ... do	212,870	202,164
Tin, all forms ... long tons	127	118
Tungsten, all forms	660	450
Zinc, all forms	3,230	3,210
Miscellaneous:		
Other metallic ores	116	124
Other base metals	77	41
Nonmetals:		
Abrasives, natural	161	107
Asbestos	9,511	9,303
Barite, including witherite	203	184
Borates, natural	50	NA
Cement	61,324	[1] 11,787
Chalk	122	35
Clays:		
Refractory	399	934
Other	8,484	6,813
Cryolite and chiolite	65	NA
Diamonds:		
Uncut (rough) ... carats	2,154,656	2,962,000
Semipolished ... do	25,000	33,000
Cut or polished ... do	19,544	NA
Industrial, including bort ... do	------------	653,000
Dust ... do	17,030	NA
Feldspar	1,939	1,665
Fertilizers:		
Nitrogenous	21,791	533
Other	500	5
Fluorspar	366	768
Fuller's earth and infusorial earths	3,254	3,725
Graphite	47	43
Magnesite	1,340	963
Mica	91	89
Quartz, including quartzite	421	280
Steatite and talc	747	1,182
Sulfur	68,904	50,241
Titanium oxides	1,164	1,011
Other	803	554
Mineral fuels:		
Coal	20,445	12,934
Peat briquets	483	412
Coke, including semicoke	26,009	7,638
Coal tar and derivatives	3,364	1,062
Petroleum:		
Crude ... thousand 42-gallon barrels	15,338	• 19,941
Refinery products:		
Gasoline ... do	• 70	------------
Kerosine ... do	• 12	------------
Diesel oil ... do	32	------------
Residual fuel oil ... do	• 2,592	• 2,433
Lubricants, including grease ... do	119	114
Waxes ... do	16	22
Other ... do	21	32
Total refinery products ... do	2,862	2,601

• Estimate. NA Not available.

[1] Does not include portland cement.

COMMODITY REVIEW

METALS

Copper.—The Timna copper mines, 25 kilometers north of Eilat, showed earnings in 1964. Although this was largely the result of high copper prices on the world market, the discovery of a new deposit for strip mining was also a factor. Ore production in 1964 totaled about 640,000 metric tons from open-pit and underground mines.

Construction of a new copper fabrication plant of Jerusalem Copper Industries was started in 1964. The plant was to begin operations early in 1965, and output was scheduled to reach 7,000 tons per year of copper products. When the plant is operating at full capacity, it will provide for some exports as well as for domestic needs.

Iron and Steel.—Between 30,000 and 40,000 metric tons of steel rod, made from melted-down local scrap and imported ingots was produced at the Acra Steelworks (steel town). An estimated 40 million tons of hematite from a deposit with 26 to 28 percent iron content in upper Galilee was not utilized in the steelworks plant because of the high beneficiation cost.

NONMETALS

Diamond.—In 1963 diamond cutting and export far exceeded all expectations; it has become one of the mainstays of Israel's exports. This was the only industry which produced solely for export, and Israel has increasingly become an international center of trade in both polished and rough diamonds. The advisory committee serving the diamond industry decided on the establishment of a special diamond institute. The main functions of the institute will be technological and theoretical research on development, tools, correct method of processing, trade, and sales promotion.

Flint Clay.—A new calcination kiln was installed at Negev Ceramic Materials Co. in 1964. The plant was imported to improve the processing of the local flint clay deposits, mainly for the production of refractory bricks. The total investment involved was $3.3 million. Israel Geological Institute conducted exploration to find more clay deposits for the new plant. The known reserve of deposits found by the institute was estimated at 300,000 metric tons.

Phosphate.—Oron fields supplied most of the phosphate production in 1964, approximately 170,000 metric tons. The natural phosphate content of 28 percent phosphorus pentoxide (P_2O_5) was being enriched, and the demand from Japan and Eastern Europe was increasing steadily, with prices 7 percent higher than in 1963.

It was reported that the negotiation of Koor Industries (Histadrut) and a U.S. firm, Swift and Co., to exploit rich phosphate deposits in the Ein Yahav area in a joint venture was proceeding satisfactorily. Swift and Co. will provide capital of approximately $60 million for this venture.

On recommendation of a French consulting firm, the Israeli Government will go ahead with the extension of the railway from Beersheba to the Oron phosphate fields, the lack of which for many years has hindered sizable expansion, effective marketing, and vigorous exploration of the mineral wealth of the region. The expansion cost has been estimated to be about $42 million.

Potash.—Considerable progress in development of the potash industry was made with completion of a large dike in the Dead Sea and by the inauguration of the new processing plant. Production of 300,000 tons of potash annually in 1965 and 1966 was expected at the Dead Sea Works at Sedom. In view of the increasing demand for fertilizers, it was planned to expand the plant capacity to 1 million tons per year. This scheme would cost an estimated $24 million which would have to be raised partly by the Israeli Government and partly from foreign sources. Potash production (170,000 tons in 1964) from the Dead Sea Works was about 17 percent higher than in 1963.

MINERAL FUELS

Petroleum.—With the discovery of a new zone in its established Heletz-Kochav oilfield in 1964, the future of the petroleum industry seemed much brighter. Lapidoth Oil Prospecting Co., Israel's oil prospectors' corporation, deepened an old well in Kochav field and completed it at 5,400 feet in a Jurassic formation, pumping 300 barrels per day. Drilling also continued in the original Kochav zone in a dolomitic limestone horizon with production of 1,000 barrels per day. Israel's petroleum production for 1964 was about 4,000 barrels per day, compared with 3,300 barrels per day in 1963.

Lapidoth planned to accelerate drilling in 1965 in order to assess the importance of the new field, Kibbutz Nir Am (near Ashkelon).

Haifa Refineries Ltd. gradually increased throughput at its Haifa refinery in 1964. Runs were 60,000 barrels per day and were expected to increase to 80,000 barrels per day in 1965. The 1964 rated capacity was reported to be 92,000 barrels per day. With addition of new facilities, which included a 9,000-barrel-per-day platformer, a 1,000-barrel-per-day unifiner, and a 400-barrel-per-day lube plant, it was hoped that the refinery would be able to produce 99-octane (RON) gasoline rather than its former 83-octane product.

The Canadian Petrocana Co. completed its seismic sounding of the offshore areas of Israel on a 400-square-kilometer concession in 1964. The data were being processed and the results will be available in the future.

Natural Gas.—Natural gas reserves in Israel's Zohar field, operated by Naphtha Petroleum Corp. Ltd., were estimated to be increased by 4 billion cubic feet. It was reported that the total reserve of the three operating wells in Zohar was slightly over 72,000 million cubic feet in 1964.

SOURCE MATERIALS

Information on the mineral industry of Israel was derived from Foreign Service dispatches of the U.S. Embassy in Tel Aviv, Israel. The country's trade data were obtained from the official publication, "Israel's Foreign Trade," issued by the Central Bureau of Statistics in Jerusalem. Background information was derived from trade journal and annual reports.

The Mineral Industry of Jordan

By E. Shekarchi[1]

◆

PHOSPHATE deposits at Ruseifa and at El Hasa and potash from the Dead Sea remained Jordan's only significant mineral resources. Production of phosphate rock was slightly over 1 percent of total world production in 1964.

Agriculture was the most important sector in the Jordanian economy, but phosphate accounted for nearly 30 percent of the value of total exports. The gross national product (GNP) was estimated at $410[2] million in 1964, an increase of 14 percent over the $360 million in 1963. The per capita GNP also rose, being estimated at $223 against $194 in 1963.

Possibilities for industrial development were limited by the size of the domestic market and the lack of raw materials. Approximately 80 percent of Jordan's population was dependent on agriculture for its livelihood. Out of a labor force of about 450,000, about 25 percent have been permanently unemployed due to a lack of jobs. Many others with skills have found work in neighboring oil-producing Arab states.

The addition of a third kiln in late 1963 at the Jordan Cement Company increased total production of cement to about 300,000 tons in 1964.

GOVERNMENT POLICIES AND PROGRAMS

In 1964 Jordan put into effect a number of self-help measures, some of which had been pending for a considerable period. The Jordanian parliament passed the revised income tax law, to be effective April 1, 1965, and this legislation has received royal approval. In June 1964 a 3-percent increase was made in all custom duties.

The Government, motivated by a free enterprise economic philosophy, continued efforts to promote private (both local and foreign) investment in industry. Foreign investment was encouraged and profits may be repatriated; invested capital may be withdrawn in four equal installments 1 year after the original investment.

Investment opportunities in the mining industry awaited foreign capital and technical assistance.

The General Water Authority signed an agreement with a British engineering firm for a geological and hydrological survey of an area between Madaba and Wadi Mansa of approximately 3,000 square kilometers. It was expected that the survey would be completed in 2 years.

---

[1] Foreign minerals specialist, Division of International Activities.

[2] Where necessary, values have been converted from the Jordanian dinar (JD) at the rate of JD1=$2.80.

The Government signed contracts in January for copper and manganese exploration in Wadi Khusheibeh and Wadi Dana and for sulfur exploitation in the Jordan valley with Otto Gold, a German firm. The sulfur exploitation covered an area of 5 square kilometers and was to be in participation with Ryco International, Ltd., of London.

PRODUCTION

The value of Jordanian ore and mineral products output totaled approximately $3.6 million in 1964. The value of petroleum refinery products, approximately $1.8 million, constituted half of the value of all minerals produced. Because of increase in domestic consumption of refinery products and high demand for phosphate rock for export, a gross increase in production took place in 1960–64. Phosphate production of Jordan constituted slightly over 1 percent of the total world production in 1964. Except for marble, which showed a substantial decrease in 1964, output of all commodities produced in the country followed the increasing trend which started in 1960.

TABLE 1.—Jordan: Production of minerals

Commodity[1]	1960	1961	1962	1963	1964
Nonmetals:					
Cement______thousand metric tons__	165	223	235	285	308
Gypsum______metric tons__	NA	7,000	8,660	[e] 8,700	NA
Marble______square meters__	NA	15,400	15,600	11,450	1,800
Phosphate rock______thousand metric tons__	362	422	[r] 681	[r] 614	[r] [e] 630
Salt______do____	12	19	19	18	20
Mineral fuels: Petroleum refinery products:					
Gasoline______thousand 42-gallon barrels__	29	254	328	NA	[e] 450
Kerosine______do____	28	242	432	NA	[e] 511
Distillate fuel oil______do____	27	236	812	NA	[e] 813
Residual fuel oil______do____	37	230	256	NA	[e] 506
Other______do____	4	34	104	NA	[e] 406
Total (including refinery fuel and losses)_do____	132	1,154	2,032	[2] 2,235	2,685

[e] Estimate. [r] Revised. NA Not available.

[1] In addition to commodities listed, Jordan also produces limestone for cement manufacture.

[2] Estimate, based on reported 10 percent increase in refinery output.

TRADE

Leading mineral imports were iron and steel products and petroleum. Values of principal groups of mineral and metal imports were as follows: Crude petroleum, $4,777,000; petroleum refinery products, $2,777,000; iron and steel, $7,629,000; nonferrous metals (excluding zinc), $482,000; cement $230,000; fertilizers, $422,000; and nonmetallic minerals, $280,000.

Phosphates and agricultural products were the leading export commodities. Exports to the United States were negligible. The total export of phosphates in 1963 was valued at $4,075,000, or about 23 percent of the total domestic exports. Among markets for Jordan's phosphate, Yugoslavia assumed first place in 1962–63, followed by India and Czechoslovakia.

TABLE 2.—Jordan: Exports of minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Nonmetals:			
Cement	7,907	6,874	All to Saudi Arabia.
Lime	449	342	Do.
Granite and other stones	2,764	4,147	Syrian Arab Republic 836; Lebanon 2,133.
Marble	1,276	921	Iraq 468; Lebanon 325.
Phosphate	358,345	357,137	Yugoslavia 164,636; India 95,797; Czechoslovakia, 60,750; Poland 20,350.
Salt	r 8,829	1,260	All to Syrian Arab Republic.
Mineral fuels:			
Petroleum refinery products:			
Gasoline . 42-gallon barrels	6,023	4,223	All to Saudi Arabia.
Kerosine . do	NA	443	Do.

r Revised. NA Not available.

TABLE 3.—Jordan: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum, semimanufactures	266	300	China 217; West Germany 50.
Copper, semimanufactures	r 228	130	United Kingdom 64; Belgium 38.
Iron and steel:			
Pig iron	315	----------	
Semimanufactures	49,561	60,602	France 15,384; Belgium 15,315; West Germany 8,150; United Kingdom 5,740.
Lead, unwrought	279	286	West Germany 106; United Kingdom 101.
Tin, all forms	26	34	United Kingdom 26; Netherlands 7.
Zinc, all forms	21	101	NA.
Nonmetals:			
Abrasives	41	----------	
Asbestos	----------	293	West Germany 145; Lebanon 85; Czechoslovakia 53.
Cement and clinker	48,586	[1] 8,202	Iraq 4,704; Denmark 2,778.
Coal	----------	504	Lebanon 429.
Fertilizers	6,196	[2] 7,839	West Germany 3,742; Austria 1,517; United Kingdon 624.
Marble	306	463	Italy 414; Lebanon 48.
Sulfur	1,581	[3] 2,832	West Germany 1,379; United States 1,099; Greece 175.
Mineral fuels:			
Crude petroleum thousand 42-gallon barrels	1,866	2,426	All from Saudi Arabia.
Refinery products:			
Gasoline . do	15	10	Iran 4; Venezuela 3.
Kerosine . do	128	126	United States 64; Aden 29; France 19.
Gas and diesel oils . do	385	235	All from United Kingdom.
Lubricants . do	41	33	United Kingdom 13; United States 12; Netherlands 6.
Asphalt . do	2	----------	
Total	571	404	

r Revised. NA Not available.

[1] Only cement, no data available for clinker.

[2] Phosphatic 1,733; nitrogenous 4,594; potassic 1,512.

[3] Includes 692 colloidal sulfur.

COMMODITY REVIEW

METALS

Copper.—The Mineral Resources Division of the Jordanian Development Board reported that exploration of copper deposits at Wadi Khursheibeh carried out under contract with the West German firm of Otto Gold indicates reserves totalling 4 million metric tons containing 0.65 percent to 0.70 percent copper. However, the director of Jordan's mineral resources believed that this report considers only the secondary mineralization visible on the surface and does not include the primary mineralization. Future studies may show the primary mineralization to be substantial.

Manganese-bearing copper deposits of Wadi Dana, 180 road kilometers south of Amman, also were under active exploration by a West German geological mission. It was hoped that, with the new advanced technology, these deposits could be beneficiated economically.

NONMETALS

Phosphate Rock.—Al Hasa phosphate deposits, nearly 200 kilometers north of Aqaba, were explored by Ralph M. Parsons Co. of Los Angeles under a contract with the Jordan Development Board. Eight separate areas were explored and, depending on the ratio of overburden to phosphate rock to be extracted, the total reserves range between 30 million tons (at 8 to 1 maximum stripping ratio) and 21.5 million tons (at 4.25 to 1 maximum stripping ratio). The average grade is remarkably consistent and is reported to be at about 31.3 percent phosphorus pentoxide (P_2O_5), equivalent to a 69 percent BPE (bone phosphate equivalent).

Unlike the phosphate occurrence at Ruseifa where there are three separate ore horizons, there is only one comparatively thick phosphate bed at Al Hasa. Most of the phosphate deposits of Jordan occur in almost horizontal Upper Cretaceous formations as irregular lenticular shapes ranging from 1 to 6 meters in thickness. The bulk of phosphate production for 1964 was from the Al Hasa mine deposits.

MINERAL FUELS

Petroleum.—John W. Mecom, an independent oil man from Texas, was granted an exploration permit for 40 years covering the entire country; however, 50 percent must be relinquished within the first 2 years. If oil is discovered in commercial quantities, the company will have to give up 20 percent of the remaining area each 5 years. The drilling obligation is 20,000 feet per year. The first hole to be drilled was spudded at Halhul in Hebron in September, and was abandoned at a depth of 12,468 feet. It has been reported that a second hole was abandoned at a depth of 4,648 feet in late 1964.

The crude throughput in the petroleum refinery at Zerka during 1963 was 2,426,000 barrels, a 30-percent increase over the 1962 throughput.

SOURCE MATERIALS

Information on mineral development of Jordan was obtained from foreign service dispatches of the U.S. Embassy in Amman. Background information was derived from trade journals and annual reports. The country's trade data were obtained from the official publication, Statistics on Imports and Exports, issued by the Department of Statistics and Research, Ministry of Finance of the Hashemite Kingdom of Jordan.

The Mineral Industry of Kuwait

By James A. West[1]

⁂

KUWAIT maintained its position as the leading oil producing country of the Middle East in 1964, accounting for slightly more than one-quarter of this area's output. As in recent years, it continued to supply about 7 percent of the annual world petroleum requirement.

The economy of this small country was almost entirely dependent on petroleum industry earnings. On the basis of appropriate Middle East posted crude oil and refined product prices, the estimated value of production was $1,200 million in 1964, a sum nearly equal to Kuwait's gross national product. Essentially all foreign exchange earnings and about 93 percent of all government revenue were derived from petroleum operations in Kuwait proper, in the Kuwait-Saudi Arabia Neutral Zone, and in contiguous offshore territorial waters in the Persian Gulf. These sources provided government revenue of an estimated $575 million in 1964. As a result, the national income, on a per capita basis, was among the highest in the world. Approximately 6,500 persons, or 6 percent of the industrial labor force, were employed directly by the petroleum industry; however, its operations and revenues indirectly support a construction industry employing more than 25,000.

GOVERNMENT POLICIES AND PROGRAMS

In an effort to increase utilization of waste gas produced in association with petroleum, the Kuwait Government established the Shuaiba Industrial Development Board as a separate corporation to develop and operate a 10-square-kilometer industrial site about 40 kilometers south of Kuwait city. The Shuaiba project includes construction of a powerplant, a salt-water conversion plant, an oil refinery, a petrochemical fertilizer producing complex, a small-craft harbor, a general cargo pier, and an oil-products loading pier. Construction of the cargo pier, powerplant, and three separate fertilizer plants was in progress at yearend, and a contract has been awarded for the construction of a 95,000-barrel-per-day oil refinery. Natural gas for the complex will be supplied at cost by the Kuwait Oil Company (KOC) via a 42-inch diameter pipeline from the nearby Burgan oilfield.

---

[1] Chief Near East-South Asia specialist, Division of International Activities.

A law regulating commercial agencies in Kuwait was enacted on July 19, 1964. This law makes association with a Kuwaiti agent or partner an essential step for conducting most types of normal business and industrial operations in Kuwait.

PRODUCTION

The petroleum industry established new record highs in the output of crude oil and refined products in 1964. Despite substantial increases in petroleum production from neighboring states and other major oil producing areas, Kuwait's output was an estimated 27.5 percent of Middle East crude oil and 7.5 percent of total world output. Production averaged 2,117,000 barrels daily, an increase of 9.8 percent over that of 1963. Refinery throughput increased by about 10 percent, averaging nearly 218,000 barrels per day.

Large quantities of gas in solution were produced in association with crude oil recovery. Although natural gas production data are not available, it is estimated that approximately 1,000 million cubic feet per day was produced in 1964. Approximately 200 million cubic feet per day or 20 percent of the gas was utilized while the rest was flared or vented.

Some minor mineral construction materials were produced but are not reported.

TABLE 1.—Kuwait: Product of petroleum and petroleum products

(Thousand 42-gallon barrels)

Commodity	1960	1961	1962	1963	1964
Crude petroleum	594, 278	600, 226	669, 284	705, 471	774, 816
Refinery products:					
Gasoline	1, 444	1, 410	2, 505	2, 167	1, 625
Jet fuel	91	105	151	204	202
Kerosine	215	311	300	317	345
Distillate fuel oil	10, 776	10, 312	16, 072	18, 604	20, 284
Residual fuel oil	49, 693	47, 648	37, 292	38, 419	41, 455
Liquefied petroleum gas	----------	----------	956	1, 774	2, 886
Other refinery products	205	224	5, 302	5, 101	4, 853
Refinery fuel and loss	2, 519	2, 423	8, 303	7, 483	6, 457
Total output, including refinery fuel and loss	64, 943	62, 433	70, 881	74, 069	78, 107

TRADE

Kuwait's petroleum exports, valued at an estimated $1,100 million, was about 12 percent of the total world export demand. Continuing the trend of recent years, the volumes of crude oil and refined product exports in 1964 reached new record highs, increasing over those of 1963 by 10.7 and 23.0 percent, respectively. Crude oil accounted for about 88 percent of the value of petroleum exports.

Import statistics for 1964 are not available; however, Kuwait continued to depend on imports to expand its economy and supply materials for its huge building programs. In 1963, total imports were valued at $323.7 million and exports (chiefly reexports) other than petroleum amounted to $29.4 million. Imports of metal and mineral products accounted for about one-half the tonnage and were valued at an estimated $27.7 million or 8.6 percent of total imports. Imports of iron and steel were up sharply and accounted for nearly 6 percent of the value of all imports. Cement was the leading tonnage import commodity, accounting for nearly 40 percent of total import tonnage. The value of cement imports was an estimated 3 percent of the value of all imports.

Kuwait's commercial policy continued liberal, with trade controls applied to only a few commodities. As a party to the Arab League agreement on trade, preferential treatment was given to imports from Arab countries, but there were no bilateral trade agreements. Most commodities were either exempt from duty or taxed at 4 percent ad valorem. Historically, Kuwait has served as an entrepôt for neighboring countries, and commodities transhipped for reexport have been liable to 2 percent ad valorem duty only.

TABLE 2.—Kuwait: Exports of mineral fuels

(Thousand 42-gallon barrels)

Commodity	1963	1964	Principal destinations, 1964
Crude petroleum	629,158	696,675	Italy 153,587; United Kingdom 136,630; Japan 115,020; France 61,493; Netherlands 44,366; United States 29,639; Malaya and Singapore 21,929; Australia 20,129; West Germany 20,388; Aden 15,284; Egypt 12,735; Belgium 10,396; Denmark 8,749; Brazil 6,738; Kenya 7,255.
Refinery products:			
Light distillate	5,475	9,157	United Kingdom 3,019; New Zealand 2,162; United States 1,987; Australia 1,430; Japan 370; Italy 102.
Distillate fuel oil	16,820	19,217	United Kingdom 4,401; Malaya and Singapore 4,047; Japan 1,649; South Korea 1,639, Thailand 1,135; Netherlands 1,079; Egypt, 1,044; Taiwan 944; Uruguay 609; Canary Isles 439; France 378.
Residual fuel oil	13,813	15,329	Japan 6,956; Malaya and Singapore 2,468; United Kingdom 1,461; Canary Isles 1,380; Netherlands 892; South Korea 551; Thailand 283; Aden 244; India 105.
Liquefied petroleum gas	1,753	2,852	Japan 2,735; Canary Isles 85.
Total	37,861	46,555	
Bunkers, all flags:			
Diesel oil	896	789	(1).
Residual fuel oil	25,251	26,037	(1).

[1] Not distributed.

TABLE 3.—Kuwait: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Iron and steel	53,815	95,288	Belgium 78,403; West Germany 4,962; Poland 3,096; Rumania 2,992.
Nonmetals:			
Cement	618,966	429,674	Japan 248,701; Iraq 125,041; Poland and U.S.S.R. 55,000.
Gypsum and lime	608	826	NA.
Mineral fuels:			
Lubricants..thousand 42-gallon barrels	12	12	United States 6; United Kingdom 5.

NA Not available.

COMMODITY REVIEW

METALS

Iron and Steel.—The first steel pipe plant was declared operational in May. Kuwait Pipe Company (KUPCO) announced that the output capacity of the plant was 10,000 tons per shift per year of spiral-welded steel pipe in diameters up to 40 inches.

NONMETALS

Cement.—Kuwait produces no cement and is dependent on imports to supply the relatively large quantities needed for building programs. Imports for 1963 were down sharply from that of 1962. A study to determine the feasibility of producing cement from indigenous limestone resources was completed in 1964. Plans to proceed with construction of a cement plant were announced but tenders for award of a construction contract had not been issued by yearend.

MINERAL FUELS

Petroleum.—Kuwait Oil Company, owned jointly by British Petroleum Co., Ltd. and Gulf Oil Corp., continued to be the sole producer of crude oil within Kuwait proper. Early in 1964, cumulative production (since KOC began commercial operations in 1946) reached 7,000 million barrels. The reported proved crude oil reserve of an estimated 63,000 million barrels[2] as of January 1, 1965, was the largest in the world.

The Kuwait National Petroleum Company (KNPC), a Government-controlled corporation that was assigned exploitation rights in areas relinquished by KOC, conducted no exploration or development activities in 1964. Kuwait Shell Petroleum Development Corp. (KSPD), which held an offshore concession also was inactive. After drilling three dry holes in 1963, KSPD suspended operations pending clarification of concession boundary lines.

---

[2] Oil and Gas Journal. V. 62, No. 52, Dec. 28, 1964, p. 106.

KOC drilled 48 new wells in 1964 bringing the total wells drilled to 541 in its concession area. The record production was from seven fields having a total of 472 producing wells. The Burgan and Magwa-Ahmadi fields continued to produce most of Kuwait's oil from Cretaceous sands at depths from 3,500 to 5,000 feet. Significant but lesser production was obtained from Cretaceous zones at depths of 8,000 to 10,000 feet in the Raudhatain, Minagish, Sabriya, Umm Gudair, and Bahra fields.

Natural Gas.—The natural gas reserve was estimated to exceed 30 trillion standard cubic feet. In 1964, KOC utilized over 90 million cubic feet per day for reservoir injection in the Burgan field. Plans were underway to build a 50-million-cubic-feet-per-day injection plant in the Raudhatain field.

The Mineral Industry of Kuwait-Saudi Arabia Neutral Zone

By James A. West[1]

◆

PETROLEUM exploitation continued to be the only industrial activity of this small treaty zone in which Kuwait and Saudi Arabia each have an undivided half interest. The Neutral Zone ranked fifth in oil production among the prolific Near East producing states.

Essentially all oil produced was exported, and only about one-fourth was partially refined before shipment. On the basis of posted prices with no allowance for discounts, petroleum production had an estimated value of nearly $200 million in 1964. The Governments of Kuwait and Saudi Arabia together received an estimated $70 million in oil revenues from Neutral Zone operations. The oil operating companies employed nearly 2,000 persons.

GOVERNMENT POLICIES AND PROGRAMS

The Governments of Kuwait and Saudi Arabia reached agreement on a division of the Neutral Zone onshore area for administrative purposes. The arrangement will not affect natural resources, which will continue to be shared between the two countries. Negotiations were continued on the problems of establishing ownership of offshore islands and boundaries, but no agreements were announced.

It was reported[2] that the Japanese-owned Arabian Oil Co. Ltd. (AOC), which holds offshore concession rights from both governments, reached an agreement with Cities Service Oil Co. for a 25-percent participation by Cities Service in AOC operations. The Kuwait Government has approved this agreement, and approval by Saudi Arabia is expected. This new accord would provide an outlet for a substantial increase in offshore oil production.

PRODUCTION

The record high petroleum production rate of 360,041 barrels per day in 1964 was largely the result of greatly increased offshore output. Output for the year was valued at $200 million. During 1964, offshore production averaged 174,346 barrels per day, an increase of 31.8 percent over that of 1963, and was approaching 200,000 barrels per day at yearend. Onshore production of 185,695 barrels per day was only about 5 percent greater than that of 1963. A trend of relatively steady onshore production with major increases in offshore production is thus indicated.

---

[1] Chief, Near East-South Asia specialist, Division of International Activities.
[2] Petroleum Press Service. V. 31, No. 9, September 1964, p. 351.

Refinery operations consist of partial processing of crude oil to produce fuel oil and small quantities of naphtha. Nearly 87,000 barrels per day of crude oil was so processed in 1964. The refined products are frequently blended into crude oil before shipment.

TABLE 1.—Kuwait-Saudi Arabia Neutral Zone: Production of petroleum and petroleum products

(Thousand 42-gallon barrels)

	1960	1961	1962	1963	1964
Crude petroleum	49,829	65,153	89,224	114,535	131,416
Refinery products:					
Residual fuel oil	• 10,250	• 14,600	25,971	27,390	28,694
Other refinery products	• 1,200	• 1,180	1,885	2,707	2,200
Refinery fuel and loss	• 400	• 520	967	955	910
Total output refinery products	• 11,850	• 16,300	28,823	31,052	31,804

• Estimate.

TRADE

Exports of petroleum and refined products are the only mineral commodities recorded for Neutral Zone trade. These exports were valued at an estimated $190 million in 1964.

TABLE 2.—Kuwait-Saudi Arabia Neutral Zone: Exports of petroleum and petroleum products

(Thousand 42-gallon barrels)

Commodity	1962	1963	1964	Principal destinations, 1964
Crude petroleum	63,047	92,908	108,792	Japan, 78,076; United States, 16,670; Italy, 5,961; West Germany, 4,211; Netherlands, 1,627; Denmark, 1,060; France, 777.
Refinery products:				
Residual fuel oil	16,992	15,692	17,876	Japan, 9,187; Singapore 2,073; Italy, 1,380; Greece, 1,261; Netherlands, 1,055.
Other refinery products	1,885	566	797	United States, 360; New Zealand, 297; Japan, 140.
Bunkers (residual fuel oil)	3,661	3,100	3,598	All flags.

COMMODITY REVIEW

MINERAL FUELS

Petroleum.—Proved crude oil reserves of the Neutral Zone were reported[3] as an estimated 12.5 billion barrels. Oil operations onshore and in territorial waters to the 6-mile limit are jointly conducted by the American Independent Oil Co. (Aminoil) and Getty Oil Co. (Getty) under separate concession agreements granted by Kuwait and Saudi Arabia, respectively. Most oil production is from the Wafra field which produces 16° to 26° API gravity crude oil from several Eocene and Cretaceous formations at depths of 1,200 to 6,800 feet. In mid-1964, the South Fuwaris field, located about 10 miles south of Wafra, began production. Development drilling at South Fuwaris established this field as a major discovery of new reserves of 33° API gravity crude oil in Cretaceous and Upper Jurassic formations at depths of 4,000 to 7,000 feet. Facilities to gather and transport up to 20,000 barrels per day of this crude oil have been constructed.

---

[3] Oil and Gas Journal. V. 62, No. 52, Dec. 28, 1964, p. 106.

The Arabian Oil Co. had separate concession agreements with Kuwait and Saudi Arabia and is the sole operator and producer of oil in the offshore area outside the 6-mile limit. The boundaries of this offshore area and certain islands were the subject of controversy and negotiations between affected Persian Gulf states. All 1964 production was from the Khafji field, which produces 26° to 27° API gravity oil from the Bahrain zone and 34° API gravity crude oil from the Ratawi zone at depths of 5,500 and 7,000 feet, respectively. AOC discovered oil in the shallow Brachycythere horizon at Khafji, a horizon not elsewhere productive in the Persian Gulf area. This horizon in the Upper Cretaceous is reported to contain large new reserves of 27° API gravity oil. Several new wells were completed in this zone during the year. No new drilling at al-Hout, a 1963 new field discovery, was reported. An exploratory well, at al-Zaur in the northern part of the concession, was drilled to 8,620 feet and was abandoned.

Refinery throughput at Aminoil's Mina Abdullah (Kuwait) and Getty's Mina Saud refineries averaged 86,896 barrels per day. Fuel oil and naphtha were the only products of these refineries; however, Getty began construction of modifications to its plant to produce a wider range of products. Arabian Oil Co. obtained agreements with both governments to construct a 30,000-barrel-per-day refinery in the Neutral Zone at Ras al-Khafji.

The Mineral Industry of Saudi Arabia

By James A. West[1]

◆

PETROLEUM continued as Saudi Arabia's only highly developed mineral resource and the mainstay of its economy. In 1964, the country's record petroleum production was about 7 percent of the annual world output and ranked Saudi Arabia second among Middle East producers. Small quantities of cement, salt, and minor construction materials continued to be produced. Mineral resources surveys and feasibility studies were conducted by government agencies in an effort to develop additional mineral industries based on major deposits of iron ore and potentially significant deposits of other metals and nonmetals.

The value of crude petroleum produced in 1964 was about $1,100 million. This is nearly equal to the gross national product, estimated at $1,120 million in 1963. Revenues from petroleum and refined products have accounted for about 85 percent of all government income. In 1964, oil revenues from operations in Saudi Arabia and from Saudi Arabia's share of the Kuwait-Saudi Arabia Neutral Zone were about $520 million. The petroleum industry employed nearly 10,500 Saudi Arabs and about 2,500 persons of other nationalities. About 1,000 Saudi Arabs were employed in mining and processing of construction materials.

GOVERNMENT POLICIES AND PROGRAMS

Government programs for industrial projects to diversify the economy received continued support. The current budget provided $169 million for such projects and several new programs for development of mineral resources were announced. The General Petroleum and Mineral Organization (Petromin), a government agency, purchased the bulk plant of Arabian American Oil Co. (ARAMCO) at Jidda and became a distributor of petroleum products. Petromin carried on oil exploration surveys in the Red Sea and central areas of the country and announced formation of a contract drilling company with a French firm. An agreement was reached with the French firm Régie Autonome des Pétroles (RAP) for oil exploration in Saudi Arabia's Red Sea area. If oil is found, Petromin will participate in the development company. Petromin awarded a contract for the design of a

---

[1] Chief, Near East-South Asia specialist, Division of International Activities.

12,000-barrel-per-day oil refinery at Jidda to the U.S. firm Universal Oil Products Co.

The Saudi Arabian Government awarded a contract for construction of an iron and steel rolling mill at Jidda to W. H. A. Robertson & Co. of the United Kingdom. The mill will have an annual output capacity of 45,000 tons of reinforcing bars, sections, and other construction materials, and will be capable of expansion to 60,000 tons. Initially, the plant will operate on imported pig iron but may expand into processsing local iron ores.

The Government conducted negotiations with various international firms concerning the establishment of petrochemical plants in the eastern provinces to utilize the abundant natural gas resources. It was announced that a U.S. firm, in conjunction with private Saudi Arabian investors, would construct and operate a 600-ton-per-day ammonia plant and a 35-ton-per-day sulfur plant at a cost of about $20 million.

Government Decree No. 25 of February 25, 1964, established a Foreign Investment Code to extend incentives to foreign investors. It provides 5-year tax exemptions to development industries, other than petroleum and minerals extraction, for enterprises having at least 25-per-cent Saudi Arabian capital.

PRODUCTION

The trend of annual increases in the output of crude oil and refined products from Saudi Arabia's huge oil resources continued in 1964. Record average daily production of 1,716,106 barrels of crude oil and average daily refinery runs of 283,251 barrels were about 5 percent greater than in 1963. Output of liquefied petroleum gases nearly doubled. Significant gains were made in the output of building materials and salt.

TABLE 1.—Saudi Arabia: Production of minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Nonmetals:					
Cement	----------	105,000	152,000	186,000	239,817
Gypsum	----------	----------	10,500	36,000	NA
Marble	NA	NA	240	48,400	NA
Salt	----------	----------	----------	9,700	NA
Mineral fuels:					
Crude petroleum ---- thousand 42-gallon barrels	456,453	508,269	555,056	594,592	628,095
Refinery products:					
Aviation gasoline ---- do	288	427	313	335	373
Motor gasoline ---- do	9,779	9,046	8,327	10,440	13,537
Jet fuel ---- do	2,553	3,361	4,428	4,506	6,159
Kerosine ---- do	5,950	5,839	3,775	3,805	3,197
Distillate fuel oil ---- do	10,635	13,065	12,310	15,174	13,689
Residual fuel oil ---- do	45,148	49,758	51,951	53,388	56,376
Liquefied petroleum gas ---- do	216	NA	1,058	2,116	4,031
Miscellaneous ---- do	2,533	4,322	3,535	4,866	5,814
Refinery fuel and loss ---- do	5,210	4,994	4,180	3,872	4,525
Total ---- do	82,312	90,812	89,877	98,502	107,701

NA Not available.

TRADE

Petroleum and petroleum products comprise more than 99 percent of Saudi Arabia's commodity exports. No detailed statistics on trade of mineral commodities other than petroleum are available.

Exports of crude oil and refined products were valued at about $1,000 million in 1964, with crude oil accounting for more than three-fourths of the total. Petroleum product imports in 1964 consisted of an estimated 4,000 barrels of aviation gasoline and 23,000 barrels of lubricants.

Imports of metals and minerals consisted largely of iron and steel, cement, and other building materials. Such imports for 1963 and 1964 were believed to be 15 to 20 percent greater than the level of imports for fiscal year 1961–62, which were valued at $30 million.

TABLE 2.—Saudi Arabia: Exports and reexports of petroleum and petroleum products [1]

(Thousand 42-gallon barrels)

Commodity	1962	1963	1964
Crude petroleum	462,222	494,992	527,011
Refinery products:			
Aviation gasoline	227	115	144
Motor gasoline	6,534	8,421	10,755
Jet fuel	4,417	4,445	5,913
Kerosine	3,253	3,018	2,201
Distillate fuel oil	10,609	13,813	11,390
Residual fuel oil	36,614	42,901	40,613
Liquefied petroleum gas	995	1,674	4,076
Total	62,649	74,387	75,092
Bunkers, all flags:			
Distillate fuel oil	500	557	417
Residual fuel oil	14,300	15,446	15,754

[1] Data on geographic distribution of individual items are not available. The continental distribution of total crude oil and refinery products produced by ARAMCO (excluding bunkers) in 1964 was as follows, in percent: Europe, 42; Asia and Australia, 40; South America, 7; North America, 7; and Africa, 4.

COMMODITY REVIEW

METALS

Iron and Steel.—Three major iron ore deposits have been discovered in Saudi Arabia, and studies to determine the feasibility of commercial development of the deposits continued. Ferruginous sediments at Wadi Sawawin, about 200 kilometers south of Aqaba and 60 kilometers from the Red Sea, contain an estimated reserve of 1.5 billion tons of low-grade (30 to 40 percent iron) ore. Oolitic hematite deposits at Wadi Fatima, 50 kilometers east of Jidda, contain an estimated 50 million tons of 40 to 50 percent iron ore. Small deposits, estimated to contain 6 million tons of high-grade (64 percent iron) ores, are located at Wadi Idsas.

Beneficiation tests and economic studies are being conducted to determine if direct reduction methods are applicable to processing ores for possible use at the proposed iron and steel industry at Jidda.

NONMETALS

Construction Materials.—In 1963, the Arabian Cement Co. plant at Jidda and the Saudi Cement Works at Hofuf were operated at about two-thirds of their combined daily capacity of 750 tons. Plans to build a new furnace and increase the output of the Hofuf plant were announced in March 1964. The National Gypsum Co. plant at Riyadh was operated at near capacity in 1963. Two small lime plants near Dhahran were in operation but their output was not reported. Marble was produced from numerous small quarries at Wadi Fatima east of Jidda.

MINERAL FUELS

Petroleum and Natural Gas.—All oil production and refining operations in Saudi Arabia proper were conducted by the Arabian American Oil Co. (ARAMCO), owned 30 percent by Standard Oil Co. (New Jersey); 30 percent by Standard Oil Co. of California; 30 percent by Texaco, Inc.; and 10 percent by Socony Mobil Oil Co., Inc. ARAMCO has discovered 10 fields in eastern Saudi Arabia and 3 offshore fields in the Persian Gulf. Estimated proved liquid hydrocarbon and natural gas reserves as of January 1, 1965, were reported as approximately 60 billion barrels and 25,000 billion standard cubic feet, respectively. The petroleum reserve is about 17.5 percent of the total reported world reserve, second only to that of Kuwait.

Petroleum produced in 1964 was from 10 fields having a total of about 275 wells connected to production facilities. The offshore Manifa field and the Haradh area of the Ghawar field were brought into production during 1964. Ghawar, Safaniya, and Abqaiq fields continued as the main producers, accounting for 87 percent of total ARAMCO 1964 output; the remaining 13 percent was from Khursaniyah, Abu Hadriya, Qatif, Fadhili, Dammam, Manifa, and Khurais fields. The Ras Tanura refinery operated at near capacity. ARAMCO began modification and construction of new facilities at Abqaiq and Ras Tanura to increase liquefied petroleum gas production capacity from 12,000 to 18,500 barrels per day.

ARAMCO continued active exploratory and development drilling in its offshore and onshore concessions. In offshore operations, additional delineation and development wells were drilled in the offshore extension of the Qatif field, in the Safaniya field, and in the Abu Safah field (in the area covered by a profit-sharing agreement between Saudi Arabia and Bahrain). A new field was discovered onshore at Berri about 3 miles northwest of Jubail. Delineation drilling to evaluate the discovery continued at yearend. Additional development wells and production facilities were completed in the southern part of the Ghawar field to expand production capacity by 125,000 barrels per day. Production from this area began in October. Additional development in the Ain Dar area will increase output by 34,000 barrels per day.

ARAMCO continued to implement its long-range reservoir injection programs to assure maximum economic recovery of oil. Additional injection wells and facilities to increase injection of water, gas, and liquefied petroleum gases into the Abqaiq and northern Ghawar fields were completed. During 1964, water injection around the periphery of the Abqaiq field averaged 406,630 barrels per day and in the Ghawar field 104,365 barrels daily. An average of 154.9 and 89.9 million cubic feet of gas daily was injected in the Abqaiq and Ghawar fields, respectively. A total of 5,730,450 barrels of liquefied petroleum gas also was injected in these fields.

The Mineral Industry of the Syrian Arab Republic

By E. Shekarchi[1]

⁂

SYRIA remained primarily an agricultural country. No thorough geological survey has been carried out although some deposits of poor-grade lignite, natural gas, petroleum, phosphates, and salt have been found. Petroleum exploration has produced several strikes to date, and reserves have been estimated to total over 1,250 million barrels.

Availability of petroleum products from the Homs refinery and the presence of an important hydroelectric power potential are both conducive to industrial development in Syria. Out of approximately 150,000 kilowatts of potential hydraulic power from the Syrian river system, only 25 percent has been developed to date.

About 70 percent of Syria's estimated 5.4 million population constitutes the farm labor force. It is estimated that about 6,300 persons were employed in all mineral-based industry in 1964. Only about 600 persons were involved in mineral production and the rest in refinery, pipeline stations, and cement and glass manufacturing. Based on the 1962 estimates, the per capita gross national product (GNP) was $148, but because of the preeminent position of agriculture in the economy, national income is greatly influenced by the weather. Government revenues from mineral activities were estimated at $35 million[2] in 1963.

GOVERNMENT POLICIES AND PROGRAMS

At yearend 1964, the Government of the Syrian Arab Republic was prepared to issue decrees nationalizing 107 privately owned firms in Syria. Practically all the important manufacturing concerns, not already in public ownership were affected, including factories producing textiles, sugar, construction materials, glassware, rubber, carpets, ceramics, and foodstuffs. The shareholders were to be compensated at 3 percent by government bonds redeemable over 15 years.

Plans were also made by the Syrian Government to prohibit the granting of any concession for exploitation of the country's mineral and petroleum resources to any natural or legal person, Syrian or foreign, early in 1965. Such exploitation was to be thereafter reserved exclusively to the State.

---

[1] Foreign minerals specialist, Division of International Activities.

[2] Where necessary, values have been converted from the Syrian pound (SL) at the rate of SL1=US$0.4563.

The capacity of the government-owned Homs refinery was to be increased from 1 million to 1.7 million tons. The work is to be carried out in three stages, the first of which was expected to be completed by the end of 1964. The Czechoslovak firm Techno-Export, which built the plant, will also be in charge of this expansion.

Meanwhile, the General Petroleum Authority completed studies for the construction of a refinery in the Djezireh area in the northeast of the country. This would process crude oil from the Karachuk and Suwaidiyah fields. Present plans are for the plant to begin production in 1968 with an initial capacity of 300,000 tons per year.

The Ministry of Industry has formed a committee to study the preliminary report relating to a salt exploitation contract signed with the German company, Bergbau Blautung.

PRODUCTION

Syrian mineral production continued at about the same rate in 1964 as in 1963. An increase of 12 percent was shown in Homs refinery production in 1964 over that of 1963. Natural asphalt, cement, and salt in 1964 showed a level of production equal to that of 1963. From available reports, an increase of 33⅓ percent in gypsum production was indicated. The government hoped that its planned actions to improve the mineral industry of the country under the complete supervision and control of the State would bring better results in 1965.

TABLE 1.—Syrian Arab Republic: Production of minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Nonmetals:					
Asphalt, natural	21,462	27,476	32,633	36,782	36,000
Bitumen calcareous silt (bitumen 10–14 percent)	35,000	NA	NA	NA	NA
Cement .... thousand tons	489	540	607	685	720
Glass sand	NA	NA	[1] 8,000	NA	NA
Gypsum	13,500	8,000	15,000	• 15,000	20,000
Salt .... thousand tons	10	7	18	• 18	20
Sulfur	53	47	----------	NA	NA
Mineral fuels:					
Petroleum refinery products:					
Gasoline .... thousand 42-gallons barrels	910	1,024	995	1,076	1,223
Kerosine .... do	752	846	818	819	938
Diesel fuel .... do	1,301	1,464	1,501	1,881	2,138
Residual fuel .... do	1,908	2,150	2,183	2,222	2,532
Asphalt .... do	104	165	127	158	185
Liquefied petroleum gas .... do	7	39	49	84	92
Total refinery products .... do	4,982	5,688	5,673	6,240	7,108

[1] Minimum estimate based on Damascus plant capacity and 1962 Syrian production. Plant supplied from nearby sand deposits.

• Estimate. NA Not available.

TRADE

Syria was dependent entirely on imports for much of its iron, steel, nonferrous metal, and building material requirements. Imports of steel, nonferrous metals, and building stone valued at $68 million constituted approximately 29 percent of the value of total imports. Petroleum products and crude oil valued at $16 million, or 7 percent of total imports were second in importance. Imports of nonmetallic minerals, in comparison with 1962 figures showed a slight decline.

Total exports of all commodities in Syria in 1963 were estimated at $229 million. Mineral and refinery product exports in 1963 were somewhat similar to that of 1962, although total export of the country, valued at $229 million, was 12 percent higher than 1962 total exports.

TABLE 2.—Syrian Arab Republic: Major mineral and metal exports

(Metric tons unless otherwise stated)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Iron and steel:			
Scrap	3,194	5,125	Yugoslavia 5,000; Lebanon 109.
Rolled and other	69	61	Lebanon 41; Saudi Arabia 7.
Nonmetals:			
Asphalt	1,003	300	All to Cyprus.
Gypsum	430	9,251	Lebanon 8,886; Jordan 361.
Talc	139	173	All to Jordan.
Various construction materials	247	220	Lebanon 145; Jordan 6.
Mineral fuels: Petroleum refinery products: Gasoline thousand 42-gallon barrels	435	333	Netherlands 326; Saudi Arabia 6.

TABLE 3.—Syrian Arab Republic: Major mineral and metal imports

(Metric tons unless otherwise stated)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum:			
Ingots	404	404	Saudi Arabia 107; Lebanon 94.
Semimanufactures	1,195	1,045	Lebanon 470; mainland China 137; Italy 129.
Copper:			
Ingots including scrap	333	478	Saudi Arabia 136; Jordan 93; Lebanon 93.
Semimanufactures	[r] 946	1,665	United Kingdom 580; Italy 276; West Germany 102.
Gold troy ounces	[r] 611	110	All from West Germany.
Iron and steel:			
Cast iron	1,437	984	U.S.S.R. 464; West Germany 440.
Scrap	1,986	2,119	Lebanon 1,100; Kuwait 365.
Ingots	326	277	All from Belgium.
Semimanufactures	181,011	92,088	Poland 19,538; Belgium 18,947; mainland China 11,506.
Lead:			
Ingots	721	604	United Kingdom 305; West Germany 96.
Semimanufactures	[r] 190	35	Belgium 18; West Germany 9.
Silver troy ounces	[r] 5,246	2,866	United Kingdom 2,756; West Germany 101.
Tin:			
Ingots long tons	70	60	Mainland China 31; Malaysia 24.
Semimanufactures do	20	7	West Germany 3; United Kingdom 3.
Zinc, all forms	[r] 214	70	Belgium 31; Lebanon 15.
Nonmetals:			
Abrasives	583	310	Greece 251; Italy 15.
Asbestos	4,975	4,667	Lebanon 2,614; Italy 1,570; Czechoslovakia 361.
Building stone, including broken stone.	266	3,770	Italy 3,529; Jordan 222.
Cement	16,541	17,951	Yugoslavia 7,565; Denmark 5,646; West Germany 1,300.
Chalk	NA	1,642	Belgium 834; France 737.
Clays	866	1,205	Lebanon 924; West Germany 151.
Fertilizers (mineral and chemical)	64,409	65,230	West Germany 22,763; Netherlands 16,348; Italy 9,819.

See footnotes at end of table.

TABLE 3.—Syrian Arab Republic: Major mineral and metal imports—Continued

(Metric tons unless otherwise stated)

Commodity	1962	1963	Principal sources, 1963
Nonmetals—Continued			
Fuller's earth	630	115	West Germany 64; Hungary 30.
Graphite	36	17	United States 16.
Magnesite	55	16	India 15.
Marble	7,028	1,674	Jordan 1,162; Italy 362.
Ocher and other earth colors	630	31	West Germany 12; United Kingdom 12.
Salt	18,104	23,480	United Arab Republic (Egypt) 11,692; Tunisia 8,000; France 2,650.
Sand (including quartz)	912	5	All from West Germany.
Sulfur	1,049	567	France 276; Poland 130.
Talc	499	233	Mainland China 230; United Kingdom 3.
Other	28	45	Mainland China 31; United Kingdom 8.
Mineral fuels:			
Coal and anthracite	[r] 2,175	1,931	Belgium 1,461; Lebanon 227; U.S.S.R. 200.
Coke (including petroleum coke)	1,949	1,074	West Germany 876; Belgium 173.
Fuel briquets	1,625	1,930	Belgium 1,460; U.S.S.R. 200.
Petroleum:			
Crude..thousand 42-gallon barrels	5,856	6,561	All from Iraq.
Refinery products:[1]			
Gasoline ....do	49	69	United States 29; Iran 24.
Kerosine ....do	43	57	Aden 13; Iran 13; Italy 11.
Diesel fuel oil ....do	[e] 700	2,081	Kuwait 714; U.S.S.R. 577; Aden 398.
Lubricants ....do	155	120	United Kingdom 57; United States 15.
Liquefied petroleum gas ....do	21	17	Greece 16.
Other (including asphalt) ....do	44	34	Iraq 9; United Kingdom 3.
Total ....do	1,012	2,378	

[1] Source: International Petroleum Quarterly, Annual 1963.

[e] Estimate. [r] Revised. NA Not available.

COMMODITY REVIEW

METALS

Geological investigations have not revealed any sizable economical deposits of ferrous or nonferrous metals in Syria. Low-grade iron ore of Raju, 25 percent, appears to be uneconomical. Insignificant quantities of steel scrap for domestic industry are imported each year.

NONMETALS

Cement.—The cement industry was 25 percent government-owned. In August 1964, a contract was signed between the cement company for building a factory to produce cement pipes and waved slabs. Total cement production was estimated to be 700,000 metric tons. The Société Nationale de Cement has expressed a desire to double the present 300-ton daily capacity of the cement plant in Aleppo.

Fertilizers.—Proven reserves of 15 million tons of 28.5 percent phosphorous pentoxide (P_2O_5) (Kneifis deposits) and 60 million tons of 24.5 percent P_2O_5 (eastern deposits) of southwest Palmyra in northern Syria were not exploited by the end of 1964. The Government was reported to be contemplating an arrangement under which raw phosphate would be exchanged for the equipment and material needed for a phosphate processing plant. Apparently Polish, Rumanian, and United States firms expressed interest in a project of this nature. Significant phosphate deposits discovered recently in the desert section of the country were considered to be part of the project.

Construction of a nitrogenous fertilizer plant with a planned capacity of 110,000 metric tons was started in 1963, but it was not operating by end of 1964.

Sand.—Glass sand deposits near Al Mazzih were the most important material source for the Damascus glass factory in 1964. Sand production was estimated from an unofficial source to be around 12,000 tons.

MINERAL FUELS

Petroleum.—After nationalizing of petroleum distribution in the country, Syria through the General Petroleum Authority (GPA) signed a 1-year contract with France's Institute Français du Petrole (IFP) to advise on marketing procedures, refining processes, resource evaluation, and general buildup of a national oil industry. A training program of Syrian personnel in all these fields by the IFP advisors was also included in the contract.

In December 1964, the government issued decrees nationalizing all mineral and petroleum resources effective January 1, 1965. Nationalization markedly affected the following:

1. Karatchuk oilfields developed by two American oil firms with potentials ranging from 500 to 700 barrels per day. The government drilled 9 more wells and now claims a proven reserve of 300 million barrels.
2. Suwaida oilfield developed by Concordia, a Deutsche Erdol subsidiary with wells of a flowing range of 700 to 3,300 barrels per day. Syrian Government's General Petroleum Authority claimed a proved recoverable reserve of 700 million barrels at the end of 1964.

It was reported that the GPA explored in Rumailian, Hauze, and Khurbe, and some small pools were found.

The 320-mile system of 6-inch products pipeline connecting the government-owned Homs refinery near Damascus to Aleppo and Lattakia was completed and put in operation. In 1964 throughput of the refinery was reported to be about 14,000 barrels per day or 70 percent of rated capacity. After expansion of Homs refinery (by Czechoslovak-Syrian agreement), the production capacity was to be 25,000 barrels per day.

Early in 1965 the Syrian Government signed an agreement with the U.S.S.R. to act as contractor for the drilling of deep development wells in the Karatchuk and Rumailan oil fields.

Natural Gas.—In the latter part of 1964, in a well drilled by the State's General Petroleum Company in the Rumailan field in notheast Syria, high-pressure gas and light oil was encountered in a new horizon at 3,076 meters. It was reported in an 8-minute test that the rate of flow was 1 million cubic meters per day of wet gas with a wellhead pressure of 4,150 pounds per square inch, together with 190 barrels per day of 48° API oil.

The Mineral Industry of Turkey

By E. Shekarchi[1] and C. A. Wendel[2]

⁂

THE Turkish mineral industry, favored with a wide variety of relatively rich and advantageously located mineral deposits, continued to contribute significantly to the nation's economy, both through its share of the gross national income and its foreign exchange earnings.

In 1964 the mineral industry, excluding petroleum, added about $300 million to national income. The significant contributions of the mineral industry of Turkey to the world's mineral output remained chromite, copper, antimony, and borate (10 percent, 0.5 percent, 2.8 percent, and 17 percent, respectively, of 1964 world production). Other exchange earners were meerschaum, magnesite, marble, and manganese with a total export value of $28.5 million.[3] The value of all mineral production in Turkey, including the major finished products, coke, cement, pig iron, and steel but excluding petroleum, increased by 14.1 percent in 1964 to a total of $300 million as compared with $268 million in 1963. Deleting the industrial products, the comparative figures were $193 million in 1964 and $169 million in 1963, a gain of 14.2 percent. The general trend in value of mineral and metal imports was downward in 1964, reversing the 5.8 percent increase registered in 1963 over the 1962 level. The decrease in 1964 was apparently due to decreased import expenditure for iron and steel more than counterbalancing increases in other categories, particularly crude petroleum and base metals.

According to United Nations estimate, the labor force of Turkey constituted approximately 50 percent of the total population; this relatively high figure occurs because many women and children were engaged in agriculture that employs 75 percent of the labor force. The remaining 25 percent were employed largely in the industrial sector of the economy, including the mining and mineral processing industry. Per capita gross national product (GNP) based on 1962 prices was $222 in 1964, and total GNP increased slightly less than 4 percent over 1963 level.

---

[1] Foreign minerals specialist, Division of International Activities.
[2] Minerals attaché, U.S. Embassy, Ankara, Turkey.
[3] Where necessary, values have been converted from Turkish lira (TL) at the rate of TL1=US$0.11.

GOVERNMENT POLICIES AND PROGRAMS

Because the development plan target of 7 percent increase of GNP in 1964 was not achieved, the Government set forth a new program calling for and promising impartial treatment of the state and private sectors, rapid development of capital market, greater fiscal equity, and the encouragement of foreign investment in all spheres where it does not conflict with the national interest. The program also proposed a more liberal foreign trade policy, a reorganization of the export market, and greater efforts to expand and modernize local industry in 1965.

The Ereğli steel mill started trial production in the latter part of 1964. A plant was being erected in Mudanya on the Sea of Marmara for the manufacture of copper wire. The project was said to be financed by Siemens (a Finnish company) and Turkish interests. The Turkish State enterprise, Machinery and Chemical Industries Association (MKEK), a traditional producer of small quantities of metals, made impressive progress with its plans to become a major producer of a wide range of machinery and parts; apparently machine tool production began, and it was hoped that by the end of 1965 the products would be marketed.

The Ministry of Energy and Natural Resources appointed a six-man team to study the several drafts of a new mining law which were prepared at the request of the Ministry. It was believed that the Commission would soon complete its studies and prepare a revised draft to be presented to the Turkish parliament.

The Mineral Research and Exploration Institute (MTA) of Turkey made substantial progress in its mapping program of the country at a scale of 1:500,000 in 1964. The agency was working in collaboration with foreign organizations to prepare also a map series on a 1:25,000 scale. Exploration and development by MTA was to be carried out extensively in 1965.

Etibank, the state-owned mining bank, was negotiating for an AID development loan to make a feasibility study of the Küre, Espiye, and Murgul copper districts; at yearend final action had not been taken, but Etibank reportedly was considering a larger exploitation scheme of these deposits.

A significant exploration and exploitation program for petroleum has been outlined by the major petroleum producing companies in the newly found oilfield of Selmo and other petroleum districts of southeast Turkey.

PRODUCTION

Although antimony ore, concentrate, and regulus brought higher prices on the world market in 1964, production of Turkish antimony was only slightly higher than in 1963. This also was true for copper production. Chromite production continued at the same level as in 1963, with an output of 199,495 tons by the state mining organization and 271,311 tons by private mine owners. Iron ore production was the highest since 1957 and 30 percent more than in 1963 due to increased demand from the newly installed Ereğli steel plant.

Although world market prices increased, production of Turkish mercury was 13 percent below 1963 output. Pyrite and manganese production increased 37 percent and 222 percent, respectively, as compared with 1963 production levels.

Among nonmetallic minerals, magnesite production was up 117 percent, cement increased 8 percent, and marble 50 percent. The discovery of new fields of boron minerals (colemanite) resulted in a new production high, 24 percent greater than in 1963. A 23-percent increase in the overall production of coal, coke, and lignite was probably due to increased requirements of the Ereğli steel mill on the Black Sea coast.

TABLE 1.—Turkey: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Antimony:					
Ore and concentrate	2,463	2,213	2,991	^{r}3,030	3,294
Regulus	--------	--------	--------	48	58
Chromite (all grades)	479,620	402,729	469,149	^{r}463,890	412,685
Copper, blister	^{r}26,220	19,994	25,775	24,790	25,981
Iron and steel:					
Iron ore ... thousand tons	^{r}790	758	^{r}813	747	976
Pig iron and blast furnace ferroalloys[1] ... do	247	236	293	^{r}394	• 400
Steel ingots ... do	^{r}299	^{r}323	^{r}293	^{r}363	446
Lead:					
Concentrate (lead content)	^{r}1,660	^{r}3,210	^{r}3,900	^{r}2,550	1,626
Metal	470	633	637	1,881	^{r}1,960
Manganese ore	28,224	30,000	21,248	6,304	20,290
Mercury ... 76-pound flasks	1,339	1,864	2,661	2,982	2,582
Pyrite, cupreous (gross weight)	42,285	98,417	107,088	97,082	133,000
Zinc:					
Zinc-lead ore, hand-sorted	2,800	10,930	• 6,929	• 4,500	• 12,500
Zinc ore, calcined	2,360	5,700	6,399	4,000	• 8,950
Zinc concentrate	2,383	2,512	2,112	1,867	• 1,858
Nonmetals:					
Asbestos	216	450	643	370	^{r}1,171
Barite	1,500	--------	1,900	981	6,050
Bauxite	--------	--------	--------	--------	4,500
Boron minerals	69,839	65,026	113,941	88,088	130,000
Cement ... thousand tons	2,038	2,028	2,323	^{r}2,698	2,940
Clays, including fire clay ... do	NA	NA	11,000	13,000	• 13,000
Emery	6,814	8,327	3,408	7,490	12,400
Fertilizer (chemical)	--------	--------	165,066	322,257	300,930
Fluorspar	326	38	581	652	1,303
Gypsum	61,134	60,000	140,000	180,000	200,000
Magnesite	15	2,190	9,740	17,917	39,068
Marble ... cubic meters	NA	NA	10,000	• 10,000	15,000
Meerschaum ... kilograms	36,750	45,850	82,400	10,500	24,100
Perlite	NA	200	700	^{r}1,000	1,200
Salt, all types ... thousand tons	445	268	431	399	352
Sodium sulfate	623	2,485	4,774	^{r}1,264	1,264
Sulfur	17,100	15,755	18,539	19,430	22,200
Mineral fuels:					
Bituminous coal (salable) ... thousand tons	3,653	3,773	3,899	4,156	4,448
Coke ... do	713	^{r}730	740	1,071	• 1,300
Lignite ... do	2,684	2,608	2,979	3,237	3,871
Petroleum:					
Crude ... thousand 42-gallon barrels	2,624	3,075	4,157	5,090	5,897
Refinery products:					
Gasoline ... do	621	1,013	4,457	4,600	5,388
Kerosine and Jet fuel ... do	67	127	2,185	3,066	3,809
Distillate fuel oil ... do	187	585	4,593	6,563	8,515
Residual fuel oil ... do	1,199	1,828	7,426	9,400	11,277
Liquefied petroleum gas ... do	--------	7	70	130	279
Other (includes asphalt, solvent, and miscellaneous) ... do	230	799	546	677	1,023
Total ... do	2,304	4,359	19,277	24,436	30,291

• Estimate. ^{r} Revised. NA Not Available.

[1] Includes remelted scrap through 1962.

TRADE

Export of blister copper increased 30 percent over that of 1963 and export of cupriferous pyrite increased 12 percent compared with the 1963 figure. Export of manganese ore containing 35 percent manganese increased about 50 percent in 1964. Export of boron minerals (colemanite) continued to expand with a 24 percent increase over the 1963 export level. Exports of magnesite, a relatively new foreign exchange earner, was almost threefold in 1964 as compared with the 1963 level. Marble exports, mostly to Italy, increased 20 percent in 1964.

TABLE 2.—Turkey: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1963
Metals:				
Antimony ore and concentrate	2,981	3,781	2,629	West Germany 1,698; Czechoslovakia 1,240.
Chromite (all grades)	349,575	212,664	350,301	United States 57,583; France 39,080; West Germany 26,964; Yugoslavia 26,875; Norway 12,999; Czechoslovakia 11,729; Austria 10,176; United Kingdom 6,514; Japan, 4,907.
Copper:				
Ore	--------	--------	8,430	West Germany 43,995; Italy 41,500.
Blister	14,427	10,043	13,004	Spain 8,043; Finland 999; West Germany 499; Netherlands 499.
Ferrochromium	--------	1,369	5,863	Italy 1,239.
Lead-zinc ore	6,929	5,088	13,750	United Kingdom 4,088.
Manganese ore	22,482	12,043	18,140	Yugoslavia 5,245; United States 4,248.
Mercury....76-pound flasks	2,183	2,742	3,230	United Kingdom 1,614; Japan 435; Netherlands 194.
Pyrite, cupreous	110,685	85,495	95,650	
Zinc:				
Calcined ore	6,399	4,000	4,450	All to Italy.
Concentrate	--------	--------	2,586	
Nonmetals:				
Borates	88,480	91,540	118,408	Italy 43,300; France 20,516; United Kingdom 6,099; Poland 5,999; East Germany 5,000; Czechoslovakia 4,199.
Cement	--------	2,460	2,460	All to Cyprus.
Emery	5,879	8,352	9,217	Netherlands 4,900; United Kingdom 1,928; United States 1,524.
Refractory minerals:				
Magnesite	3,350	10,604	29,269	All to Austria.
Other	--------	165	--------	NA.
Marble	3,347	4,421	5,344	Italy 3,590.
Other stone and gravel	--------	222	--------	NA.
Meerschaum	51	41	58	Austria 22.
Salt	53,454	58,736	128,938	All to Japan.
Other nonmetals	--------	708	536	NA.
Mineral fuels:				
Coal, bituminous	--------	5,950	16,464	NA.
Lignite	--------	--------	38	
Petroleum refinery products:				
Gasoline	--------	41,855	47,000	West Germany 20,972; United Kingdom 15,198.
Distillate fuel oil	42,422	20,831	15,423	All to West Germany.
Residual fuel oil	497,468	674,398	690,285	United Kingdom 226,719; Greece 132,991; Netherlands 106,422; United Arab Republic 57,910; Ireland 53,419; Belgium-Luxembourg 50,246.

NA Not available.

TABLE 3.—Turkey: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1963 [1]
Metals:				
Aluminum:				
Ingots	1,280	1,216	1,579	France 614.
Semimanufactures	2,911	2,642	1,670	Israel 688; Greece 326; Netherlands 318; West Germany 282; France 226; Belgium-Luxembourg 179.
Copper and alloy, all forms	108	428	395	Italy 237; West Germany 85.
Iron and steel:				
Scrap	954	9,688	25,791	United States.
Pig iron including cast iron.	8,947	23,044	------------	West Germany 11,169; Belgium-Luxembourg 8,182; Spain 3,632.
Ferromanganese and other ferroalloys.	4,470	1,093	6,305	European Economic Community 714.
Ingots and other primary forms.[2]	9,647	76,442	------------	U.S.S.R. 24,342; Hungary 18,549; Bulgaria 13,071; West Germany 11,818; Rumania 8,191.
Semimanufactures	219,365	286,579	270,204	West Germany 74,121; United States 55,297; United Kingdom 35,260; U.S.S.R. 23,659.
Lead and alloys, all forms	2,237	2,357	1,515	United Kingdom 714; Bulgaria 653.
Nickel and alloys, all forms	88	118	108	Italy 61.
Tin and alloys, all forms	1,257	509	867	United Kingdom 245; Fed. of Malaya 158.
Zinc and alloys, all forms	5,931	5,291	5,046	Belgium-Luxembourg 2,421; West Germany 1,199; Poland 865; Yugoslavia 485.
Metallic ores, slags and ashes.	449	443	------------	United Kingdom.
Other nonferrous metals and semimanufactures.	49	21	9	United States 18.
Nonmetals:				
Asbestos	1,516	1,254	2,456	United Kingdom 579.
Barite	------------	------------	2,455	
Cement	2,171	91,068	91,533	U.S.S.R. 89,302.
Chalk, lime, crushed stone, and dolomite.	182	728	------------	France and Norway.
Clays, all types	2,288	1,689	2,357	European Economic Community 1,347.
Feldspar and fluorspar	290	725	1,939	United Kingdom.
Graphite	80	107	139	West Germany.
Magnesite	77	93	3	Greece.
Mica	11	18	53	United Kingdom.
Phosphate rock	33,349	116,248	92,517	Morocco 103,598; Tunisia 9,849.
Quartz and quartzite	151	15	38	Belgium-Luxembourg.
Sulfur	17	248	210	West Germany.
Talc	181	284	96	Italy.
Other	65	375	10	NA.
Mineral fuels:				
Coal	------------	------------	300	
Coke	575	4,143	------------	United Kingdom.
Carbon black	50	336	5,543	NA.
Petroleum:				
Crude...thousand tons	2,021	3,080	------------	Iraq 1,120; Iran 1,013.
Refinery products:				
Gasoline	185,280	4,957	NA	United States 3,697.
Kerosine	296,425	38,500	NA	United States 23,609; United Kingdom 12,090.
Distillate fuel oil	462,478	108	NA	NA.
Residual fuel oil	58,233			NA.
Other	65,278	93,794	NA	United States 79,202; United Kingdom 6,245.
Total petroleum products.	1,067,694	137,359	NA	

NA Not available.

[1] Wherever possible, detail on quantity from principal sources has been given; where only the name of a country appears, detailed quantity data are not available.

[2] Includes coil for rerolling and iron and steel blanks for pipes and tubes.

COMMODITY REVIEW

METALS

Antimony.—Özdemir Antimuan Madenleri A/S Şirketi, the major Turkish producer, continued mining and milling operations near Turhal, which is in the vicinity of Tokat. Output consisted of hand-cobbed direct shipping ore containing 40 to 45 percent antimony and concentrate containing 62 percent antimony. Since 1955, annual production of hand-cobbed ore has been about 1,000 tons and that of concentrate recovered from lower grade ores and old dump stocks, 1,600 tons.

The MTA drilling investigation in Turhal resulted in a new estimation of antimony ore reserves in the country. The estimated total reserve was stated to be approximately 155,000 tons of proved ore containing about 11–13 percent antimony.

The deposit discovered in the vicinity of Eskigümüş near Nigde by Rahsin ve Ihsan in 1963 yielded 200 metric tons of high-grade stibnite ores, which was shipped to Mersin for export. Unfortunately, the presence of 0.25 pecent mercury in the ores has prevented further sales following a trial shipment of 100 tons to the United Kingdom early in the year. Development was continued.

The Mutlu Battery Co. of Kartal became a producer of antimony regulus during the year, recording an output of about 30 tons from treatment of stocks of antimony ore, totaling 231.5 tons, purchased from small producers in the Turhal area. Reportedly, Mutlu Battery Co. was completing installation of a rotary furnace 1.5 meters in diameter and 10 meters long, for treatment of 40-percent ores, as well as a small water-jacketed furnace for treatment of 20-percent ores.

Bauxite.—Production of bauxite was reported for the first time in Turkey in 1964 when MTA mined and shipped 800 tons of high-silica material from the Akseki deposits for use as a refractory lining for electric furnaces in the Antalya electrometallurgical plant.

Deposits of high-aluminous raw materials of various types ranging from true bauxite to lateritic aluminous iron deposits occur in an extensive area along the mountain ranges paralleling the southern coast of Turkey from Izmir nearly to Gaziantep. Other deposits are known in the Zonguldak area on the Black Sea coast. Exploration of Turkish aluminum resources remained far from complete, but through yearend the following had been reported:

	Reserves (thousand metric tons)	Average analysis (percent)		
		Al_2O_3	SiO_2	Fe_2O_3
Bauxite:				
Seydişehir deposits:				
Mortas	10,000	56	7.8	NA
Dogan Kuzen	18,000	60	5.4	14
Marçukur	170	NA	8.9	NA
Subtotal	28,170	XX	XX	XX
Akseki deposits:				
Kiziltas	500	NA	9.0	NA
Ahmetage Kuyusu	425	46	18.9	12
Sultan Çukuru	380	56	3.7	26
Toprak Kapi	360	NA	5.7	NA
Gemene	250	60	8.8	17
35 others	1,200	NA	NA	NA
Subtotal	3,115	XX	XX	XX
Zonguldak	150	57	5.0	22
Total bauxite	31,435	XX	XX	XX
Diaspore:				
Mitas	40,000	55.8	10.2	NA
Mugla	10,000	NA	NA	NA
Alanya (5 major lenses)	3,000	50.2	19.4	NA
Bolkardag (30 lenses)	4,000	57.4	4.5	NA
Saimheyli (2 lenses)	10,000	53.4	7.6	NA
Total diaspore	67,000	XX	XX	XX

NA Not available. XX Not applicable.

Chromite.—During 1964, the market for Turkish chromite improved somewhat and the year's sales were about equal to those in 1962. State-owned properties operated by Etibank mined and exported more than half of total 1964 production from two groups of mines—those of the Güleman and Üçköprü regions. Turk Maadin was the leading private sector producer, and essentially shipped nothing but concentrate. Sitki Koçman, also a private producer, led in the shipment of lump ore.

According to recent studies by the statistics department of MTA, estimated reserves totaled about 5 million tons of 46 to 48 percent chromic oxide (Cr_2O_3).

Copper.—Etibank continued as the sole copper producer in the Ergani, Murgul, and Küre copper districts. Work on Etibank's Black Sea copper project involving the Çakmakkaya orebody (an extension of the Murgal deposit), the Espiye mine near Giresun, and the Küre cupreous pyrite mine were still in the planning stage at yearend.

Handsorting of high-grade copper ore at the Küre mine netted 8,430 tons of 10 percent ore which was shipped to Germany for treatment. At Ergani, Etibank expanded its 400-ton-per-day flotation concentrator to a capacity necessary for the shift to the mining of low-grade disseminated ores, a change which must take place within the next few years if the present copper output rate is to be continued. It was reported that the capacity has been raised to 800 tons per day with the addition of a new crushing plant and additional flotation cells, all manufactured in Turkey.

Iron and Steel.—*Iron Ore.*—The Divriği mine operated by Türk Demir ve Çelik, a government-owned company, continued to increase production steadily to meet the higher demands of the enlarged Karabük iron and steel plant. Production by the private sector amounted to about 320,000 tons, of which 95,000 tons from the Kesikköprü mine was shipped to the Karabük plant. The remaining private sector production was from mines under contract with the Ereğli Iron and Steel Co.; much of the ore produced by these mines was moved to stockpiles by the end of the year. The following table shows production of iron ore in 1964 and revised figures for 1963 and 1962:

TABLE 4.—Turkey: Production of selected iron ore mines

(Thousand tons)

Mine	Operating company	1962	1963	1964
Divriği	Türk Demir ve Çelik	463	580	655
Kesikköprü	Kesikköprü Maden	87	80	95
Otlukilise	Demir Export	41	11	77
Çetinkaya	do	43	14	58
Karakuz	Bilgin Maden	11	10	40
Deveci	do	16	5	38
Akdağ	Necati Akin	--------	15	--------
Büyük Eğmir	Dumeks	92	32	--------
Karamadazi	Özkoyuncu	--------	--------	4
Bünyan	Zafar	--------	--------	3
Aşvan	Arslanlar	--------	--------	5
Divriği	NA	--------	--------	3
Total		753	747	978

It was expected that during 1965 the bulk of private sector production would be from six chief ore suppliers for Ereğli: Çetinkaya (125,000 tons), Otlukilise (150,000 tons), Deveci (60,000 tons), Karakuz (100,000 tons), Akdağ (70,000 tons), and Büyük Eğmir (40,000 tons). About 80,000 tons of additional ore was expected to be purchased from nine of ten smaller mines, including the Çalti mine of Demir Export east of Divriği which will commence production in 1965 at about 20,000 tons per year, and the small private Hasançelebi mine near Hekimhan also rated at 20,000 tons annually.

One of the encouraging developments of the year was the successful exploration at the Karamadazi mine under a Mining Assistance Commission project. Under the program, 2 million tons of magnetite ore averaging about 61 percent iron was blocked out. The Mining Assistance Commission also carried out a project at Tacinköy mine 35 kilometers east of Bünyen. The orebody studied is a weathered hematite and goethite deposit; details of reserves and grade were not reported.

Steel.—The economic development of Turkey, long handicapped by a lack of domestic output of basic flat steel products, received a noteworthy assist in late 1964 when the Ereğli steel plant, the first privately owned steel plant in Turkey, began limited operations. Production scheduled to reach 50 percent of planned capacity in 1965, with full annual production of 1 million tons of finished steel products set for 1968.

Reportedly, the new Ereğli Iron and Steel Co. will concentrate on flat products such as tin plates and sheet steel, complementing the output of the publicly owned Karabük steel mill whose production is oriented toward heavy sections and other nonflat items.

The Karabük iron and steel plant operated below its rated capacity of 600,000 tons per year, producing approximately 400,000 tons of steel ingots and 1,273 tons of steel castings. The MKEK plant produced about 30,000 tons, and Metas, about 10,000 tons.

Lead and Zinc.—Available information from trade journals indicates that the lead and zinc content of ores and concentrates shipped from Turkish mines in 1964 almost doubled the output of 1963. Comparative figures for various products were as follows:

Salable product	Content (metric tons)			
	Lead		Zinc	
	1963	1964	1963	1964
Lead concentrate	1,740	2,200		
Hand sorted lead-zinc ores	810	2,050	1,710	3,245
Zinc concentrate			840	970
Calcined zinc ore			2,040	3,800
Total	2,550	4,250	4,590	8,015

Most of the increased production came from the Zamanti River area south of Kayseri and Nigde where two new mines went into operation. One of the new orebodies from which about 8,000 tons of zinc carbonate ores averaging 37 percent zinc was extracted in 1964 was reported to be 20 meters wide and 250 meters long at the surface. The largest producer, Kemal Özdedeoglu, operated two mines in the Zamanti River area, the Ayoluk and the Cemaldag. Combined production from these two mines was reported to be about 10,000 tons, of which 7,000 tons was hauled to Yeşilhisar for calcining and another 2,500 tons exported from the port of Mersin.

The second largest producer was Rahsin ve Ihsan, which shipped about 3,000 tons from its Akdagmadeni properties near Sivas as well as smaller amounts from Balya and from new mines opened near Ordu. The average grade of all mixed lead-zinc sulfide ores from various mines was reported to be about 40–45 percent combined metals.

The third ranking producer was the Dereköy mine near Yahyali (Zamanti River) owned by Oral Erginer and G. Sanoviç, Inc. which exported 4,805 tons of mixed carbonate sulfide ores containing about 28 percent zinc and 15 percent lead.

Reportedly, the Özdedeoglu Co. was scheduled to increase its total output of run-of-mine ores to 25,000 tons annually in 1965 as the company's new Aladag mine, near Sivas commences production. Output from this mine will be hauled some 60 kilometers to the company's new calcining plant at railhead. The erection at this plant of four brick kilns with a total daily capacity of 80 metric tons will double the calcining capacity in Turkey since the Karamanci plant at Başköy also has four 20-ton-per-day-capacity kilns.

Manganese.—There was a notable revival in mining of manganese ore, with production approximately three times that of 1963. With the expansion of the Karabük steel plant and the opening of the Ereğli steel plant, it was predicted that the manganese industry would probably flourish in 1965.

Mercury.—Although the production of mercury during 1964 dropped by some 400 flasks from the record production in 1963, new developments indicated brighter prospects for the future. The average grade of 16,199 tons of ores retorted at Etibank's Haliköy property declined to 0.228 percent mercury. However, due to better recoveries, the total output was 1,009 flasks against 763 flasks in 1963. The remainder of the output was largely due to production from private mines in the Sizma area near Konya, with smaller amounts from the Manisa and Karaburun districts. During the year, Etibank optioned a number of mercury properties in the Ladik distict near Konya and planned to reopen mines which had been operated by a small private company until 1960.

NONMETALS

Asbestos.—Only tremolite and actinolite asbestos have been mined and sold in Turkey. More than 150 asbestos locations are recorded in the MTA archives, ranging in size from a few kilograms to a few tons of proved reserves. Available figures indicate that Turkish asbestos production has not exceeded 2,000 tons per year but that there has been sufficient mining to supply needs of local cement and paper factories.

Barite.—Reportedly, a private mine operator in 1964 was in the process of arranging international markets for Turkish barite for the first time. Deposits are known in nine localities, scattered from near Muş in the east to Çanakkale in the west. Turkish barite averages about 93 percent $BaSO_4$, with Fe_2O_3 below 0.1 percent, and occasionally contains galena. In a well known deposit area in Muş province, where more than 42 outcrops are known, the ore averages 94 percent $BaSO_4$ and 6.5 percent Fe_2O_3, with a proved reserve of 756,000 tons and a possible reserve of 3 million tons.

Boron Minerals.—Etibank was again the major producer of colemanite, with a salable production of 51,093 tons. The private Bortaş-Mortaş group produced about 40,000 tons from its Espey and Killik properties near Emet. Other private producers, Rahsin ve Ihsan and Yakal, contributed approximately 20,000 tons from the Bigadiç area.

During the year Türk Boraks Madencilik (Turk Borax), a subsidiary of Borax Consolidated, Ltd., continued widespread exploration in the Kirka and other areas, developing large reserves of colemanite near Kirka and reportedly discovering a potential deposit of sodium borate (kernite) with a reported thickness of about 50 meters and great lateral extent.

The borax and boric acid plant under construction by the Polish Government under a contract with Etibank was not completed by yearend. Plans called for the plant to process 35,000 tons of ore annually and to produce 20,000 tons of borax and 5,000 tons of boric acid per year.

Cement.—Cement production and consumption continued upward in 1964 to reach new highs, about 8 percent over 1963 figures. The new plant of Turkiye Çimento Sanayü T.A.S. (Turkish Cement Industry—TCI) at Nigde went into operation. In the private sector the Konya plant increased its capacity to 129,000 tons. To meet the continued demand for cement in Turkey, TCI was planning to convert its Söke, Afyan, and Gaziantep plants to dry process. Annual capacities would also be increased to 165,000 tons from 125,000 at Söke, to 165,000 from 125,000 at Afyan, and to 180,000 from 140,000 at Gaziantep.

A new kiln unit of 200,000 tons annual capacity was being installed at the Adana plant; completion was scheduled for the end of 1965. The new installation will bring annual capacity of the plant to 400,000 tons. Two new cement plants were in the planning stage, one at Tralizan with 300,000 tons annual capacity and the other at Tatvan with 150,000 tons annual capacity. The Elazig cement plant is being expanded, apparently to meet the needs of the projected Keban Dam.

Of the total production, Turkiye Çimento Sanayii T.A.Ş., Sümerbank Cimento Sanayii Muessesesi (Sümerbank Cement), and private companies produced approximately 49 percent, 11 percent, and 40 percent, respectively, in 1964.

Emery.—Almost all of the emery produced in Turkey has been exported to European countries or the United States, with exports exceeding output in recent years as producer stocks have been drawn down. Most of the emery deposits in Turkey are on the border of the Menderes Massif in highly metamorphosed Permian-Triassic rocks. The principal producing areas are in an arc roughly paralleling the Aegean coast starting at Selcuk, north of Söke, and extending through Milas to Mugla. An average composition of Turkish emery is Al_2O_3, 62 percent; SiO_2, 2 percent; Fe_3O_4, 33 percent; and miscellaneous, 3 percent. Known possible reserves of emery were reported to be about 10 million tons.

Fertilizer Materials.—Although Turkey still uses less fertilizer per acre than most countries at a similar stage of economic development, consumption more than doubled between 1962 and 1964, and 1967 consumption was expected to be about 1.27 million metric tons, almost double that of 1964. Azot Sanayii T.A.Ş. (Turkish Nitrates Corp.) plant at Kütahya had an output of 115,000 tons of nitrogenous fertilizer in 1964. The plant, founded in 1962, has a rated annual production capacity of 60,000 tons of ammonium sulfate based on gypsum, 50,000 tons of calcium ammonium nitrate, 6,000 tons of nitric acid, and 10,000 tons of technical ammonium nitrate. During the year, a tender was considered for plant and machinery to raise the total capacity to 440,000 tons.

Capacity output of the Gübre Fabrikalari T.A.O. (Fertilizer Factories Corp.) plant at Iskenderun and Yarimca aggregates about 200,000 tons of superphosphate annually. Most of the phosphate rock for these plants was imported from Sfax, Tunisia. The Karabük phosphate plant also produces about 10,000 tons of superphosphate from basic slag.

TABLE 5.—Turkey: Production of chemical fertilizers

(Metric tons)

Commodity	1962	1963	1964
Ammonium nitrate	104,637	58,744	85,913
Ammonium sulfate		88,513	63,487
Superphosphate	60,429	175,000	151,530
Total	165,066	322,257	300,930

Magnesite.—Production and export of magnesite showed a remarkable increase in 1964. The new plant of Continental Ore Co. near Eskişehir went into operation and produced some 8,000 tons of caustic magnesite. The Radentheim plant, also near Eskişehir, produced calcined magnesite for export to Austria.

MTA did extensive drilling and trenching during the year at the Meram deposits a few kilometers north of Konya, under a contract with Sümerbank which planned to establish a refractory magnesite brick plant in the area. Unconfirmed reports indicated a possible reserve of 20 million tons of 30 percent magnesite ore in the vicinity of Eskişehir and in the Kütahya area.

Marble.—Small deposits of marble are found in nearly every section of Turkey. The four quarries with greatest production are at Marmara, Afyon, Sogük-Bilecik, and Gebz, all in the northwestern section of the country. Most of the marble industry in Turkey was controlled by private investors. The production and export of marble has increased considerably in recent years.

Pyrite.—Küre pyrite operations, 56 kilometers north of Kastamonu and 31 kilometers south of the Black Sea port of Inebolu, increased production to 133,093 tons of ore averaging 46.15 percent sulfur and 2.84 percent copper in 1964. During the year, Etibank and MTA began exploratory drilling in the gossan area between Akisoy and the Küre mine. Reportedly, some holes encountered 80 meters of pyrite with good copper values, and Etibank indicated that ore reserves at Küre totaled at least 4 million metric tons.

Sodium Sulfate.—The Alkali Kimya Şirketi, a joint venture of Turkish and U.S. capital which had been attempting to extract sodium sulfate from the brines of satellite lakes near Tüzgölü north of Konya, encountered further technical difficulties in producing a clean product in 1964. In spite of the problems, however, production for the year was 91 percent higher than in 1963. A team of consultants examined the property in late 1964 with the objective of alleviating the technical difficulties.

Sulfur.—Since 1959, production of sulfur has increased at an average rate of 10 percent per year. Late in 1963, a sulfuric acid plant based on the SO_2 in exit-gas from copper smelters went on stream at Murgul copper works of Etibank. The bulk of production, about 17,373 tons, was sold to Cübre Fabrikalari T.A.Ş. for manufacture of superphosphate fertilizer at its Izmit and Iskenderun plants. Three new plants reportedly were under consideration by Etibank to increase substantially sulfuric acid production. At the Ergani copper works a 30,000-ton-per-year unit based on waste smelter gases is to be erected. At

Izmir, sulfuric acid production is to be based on elemental sulfur and sulfur refinery wastes from Keciburlu, and output is to be consumed in superphosphate fertilizer plants which are planned for Izmir and Banderma. Plans for the third plant, expected to be erected on the Black Sea coast near the Küre copper deposits, were incomplete at yearend.

MINERAL FUELS

Creation of the new cabinet post of Minister of Energy and Natural Resources in 1964 brought government mineral, hydroelectric, water, and petroleum entities under one administrative authority. Apparently Türkiye Kömür Işletmeleri Kurumu (TKI), which controls the Zonguldak bituminous and the western lignite operations, will also come under the control of this ministry.

Noncommercial fuels, including 6.5 million tons of firewood, 20,000 metric tons of charcoal, and unreported quantities of animal waste, supplied more than half of the energy consumed in Turkey in 1964. Coal, lignite, petroleum, manufactured gas, and hydroelectric power supplied the balance.

The concession rights of Beyoglu Manufactured Gas Co., organized in 1914 with French capital, expired in 1964, and the company was to be taken over by Istanbul Power and Gas Administration (IETT) which already operates other gas plants in Istanbul. Beyoglu gas plant, at the peak of operation, produced about 1,435 million cubic feet per year and served about 57,000 subscribers.

Bituminous Coal and Lignite.—The state-owned Ereğli Coal Co. operation, the only bituminous coal producer in Turkey, produced 7.2 million tons of unwashed bituminous coal in 1964—an increase of 148,000 tons over 1963. Although wage increases granted in 1964 increased labor costs by $5 million, the company increased profits in 1964 to about $2.8 million from $1.2 million in 1963; 1963 had been the first year in which a profit was realized since the coal mines were nationalized in 1942.

Lignite production, obtained from both the public and private sectors, increased 18.9 percent over that of 1963.

Coke.—The combined government and private sector production of coke from coke ovens showed a 4 percent increase in 1964 over the 1963 level. Municipal gas plants contributed an additional 173,000 tons, while the semicoke plant at Zonguldak contributed another 79,000 tons. About 30 percent of the washed coal production of Zonguldak was used in coke production. The coke ovens at the new Ereğli plant began operating in late 1964 and during the year produced about 61,000 tons in preparation for the startup of the blast furnace which was scheduled for February 1965.

TABLE 6.—Turkey: Salable production of coal and lignite[1]

(Thousand metric tons)

Commodity and mining divisions	1962	1963	1964
Bituminous coal (all public sector):			
Çelik	1,456	1,594	1,701
Üzülmez	1,241	1,253	1,325
Kozlu	952	1,011	1,113
Kandilli	244	294	309
Total bituminous coal	3,893	4,152	4,448
Lignite:			
Public sector:			
Tunçbilek	982	1,042	1,288
Soma	422	380	551
Degirmisaz	156	189	195
Seyitömer	308	441	506
Total public sector	1,868	2,052	2,540
Private sector	1,111	1,185	1,331
Total lignite	2,979	3,237	3,871

[1] Reported by the Ereğli Coal Co. of Türkiye Kömür Isletmeleri Kurumu (TKI).

Petroleum.—Exploration activities in Turkey were expanded in 1964; exploratory drilling increased, and geophysical work was extended. Of the various companies operating in Turkey, the Turkish Petroleum Corp. (TPAO) had the greatest number of exploration licenses (38), followed by Mobil Exploration Mediterranean with 15, Société de Participations Pétrolières (PETROPAR) with 12, Turkish Gulf Oil Co. with 11. and Clark Middle East with 5. The most active company in obtaining new concessions during 1964 was PETROPAR. A total of 87.6 party months of activity was performed in 1964 by all firms, of which 39 party months consisted of geological work and the remainder mostly of geophysical activity.

In wildcat and development drilling, based on rig months, TPAO was dominant; most of the other companies concentrated on wildcat drilling only. There were a total of 23 wildcat wells drilled in 1964 (not counting Panoil's Bakuk No. I which was a reentry). Of these. TPAO drilled 13 wells, Shell drilled 5 wells, and Mobil drilled 3 wells. TPAO did not obtain a producer, but Mobil and Shell each had two discoveries. Mobil's discoveries were in the Selmo field of the Siirt area in southeastern Turkey; these discoveries showed an initial testing capacity of 5,000 barrels per day of 34.8° API oil and 1,300 barrels per day of 33.8° crude. Shell also made discoveries in southeastern Turkey in the Baykan and Batikaya fields with a test flow of 350 barrels per day of 31.7° API crude and 2,000 barrels per day of 36° API crude, respectively.

Engineering design of the first crude oil pipeline from southeastern Turkey to the Mediterranean was completed. Apparently the line will extend some 560 kilometers from TPAO's Batman refinery to the port of Iskenderun. Planned initial capacity was said to be 30,000 barrels per day, with an ultimate capacity of 75,000 barrels per day, but these may vary in actual practice, depending on the type of crude to be transported. Completion was scheduled for early 1967; however, bids for line pipe and euipment were not taken by the end of 1964.

Total production of crude oil by TPAO from various fields in 1964 was about 921,416 metric tons, an increase of about 23 percent over 1963 production. Crude oil output by Mobil and Shell in 1964 amounted to approximately 259,300 tons or an increase of about 118 percent over 1963 production.

During 1964, a total of 4.1 million tons of refined products was produced from a refinery run of 4.355 million tons of crude petroleum, and 3.0 million tons was consumed.

Civilian consumption of refined petroleum products increased by 13.4 percent during 1964, compared with a 17.6 percent increase in 1963 over that of 1962. In actual quantities, the 1964 increase was 354,000 tons, compared with an increase of almost 400,000 tons during 1963. In both quantitative and percentage terms, the most important consumption increase was in fuel oil, which increased by almost 200,000 tons or 34.4 percent. Kerosine consumption showed only a 3.2 percent increase compared to an increase of 12.9 percent during 1963. This relatively small increase was probably due to a higher tax on kerosine imposed in 1964.

TABLE 7.—Turkey: Civilian consumption of refined petroleum products

(Metric tons)

Product	1962	1963	1964	Percentage change
Aviation gasoline	3,170	2,069	1,742	−15.8
Motor gasoline	510,218	515,737	548,149	6.3
Jet fuel	8,116	9,130	9,972	9.2
Kerosine	397,881	449,096	463,619	3.2
Motorine (gas oil)	735,355	875,465	999,770	14.2
Diesel oil	36,593	40,152	30,880	−23.1
Fuel oil (residual)	383,661	538,561	723,601	34.4
Lubricants, grease	70,413	72,731	77,079	6.0
Asphalt	92,395	116,062	104,800	−9.7
Solvents	979	1,455	1,928	32.5
Paraffin, vaseline	144	41	225	448.8
Special preparations	1,394	6,787	6,063	−10.7
Liquefied petroleum gas	1,740	8,766	21,522	145.5
Total	[1] 2,242,136	2,636,052	2,989,350	13.0

[1] Reported total; 77 metric tons not accounted for.

Source: Petroleum Administration

The Mineral Industry of Other Arabian Peninsula Areas

By James A. West[1]

Contents

	Page		Page
Qatar	1099	Federation of South Arabia	1104
Trucial States	1101	Yemen	1106
Muscat and Oman	1103		

QATAR

PETROLEUM production remained as Qatar's only developed mineral industry and the source of essentially all its national income during 1964. Production was nearly 3 percent of Middle East crude oil output. The major development was the initial production of crude oil from offshore areas to supplement the near maximum capacity output of the single long-established onshore field.

All foreign exchange earnings and 99 percent of all government revenues are derived from petroleum operations which amounted to an estimated $65 million in 1964. The petroleum industry employed about 2,500 persons, or about 15 percent of the estimated total work force.

GOVERNMENT POLICIES AND PROGRAMS

Several new laws were published during the year designed to protect Qatari businessmen. Under one law, import licenses are to be issued only to firms having 51 percent Qatari participation, but petroleum concessionaires are not affected by this law.

The onshore and offshore boundaries of Qatar have never been firmly defined. Efforts were made to establish boundary lines with neighboring states, but the problem remained unresolved at yearend.

The Government began new development programs which include housing and the construction of an airport. Also, construction continued on the port facilities at Doha to provide a channel and pier for berthing ocean-going ships.

---

[1] Chief specialist, Near East and South Asia, Division of International Activities.

PRODUCTION

Petroleum production averaged 213,633 barrels per day in 1964, an increase of 11.5 percent over that of 1963. In January, the first offshore oilfield was brought into production at a rate of about 30,000 barrels per day.

TABLE 1.—Qatar: Production of petroleum and petroleum products
(Thousand 42-gallon barrels)

Commodity	1960	1961	1962	1963	1964
Petroleum:					
Crude	63,088	64,386	67,911	[r]70,123	78,190
Refinery products:[e]					
Gasoline	72	60	60	51	59
Kerosine	24	36	30	27	32
Distillate fuel oil	72	60	50	47	50
Residual fuel oil	24	84	----------	61	----------
Other	----------	----------	5	4	4
Refinery fuel and loss	24	12	5	NA	73

[e] Estimate. [r] Revised. NA Not available.

TRADE

Crude oil was the only significant mineral exported. All oil produced, except for about 500 barrels per day that was partially refined for local consumption, was exported. These exports were valued at an estimated $150 million in 1964, based on posted prices. The principal countries of destination were ranked as follows: United Kingdom, France, West Germany, Netherlands, United States, and Canada.

Information on imports was extremely limited. All imports were valued at an estimated $28 million in 1963 and remained near this level during 1964. Mineral imports, consisting largely of cement and other building materials, fuels, and lubricants, made up about 10 percent of the value of total imports.

TABLE 2.—Qatar: Exports and imports of petroleum and refinery products[1]
(Thousand 42-gallon barrels)

Commodity	1962	1963	1964
Exports:			
Petroleum, crude	67,728	69,623	77,815
Imports:[e]			
Petroleum refinery products:			
Gasoline	84	104	96
Kerosine	----------	36	30
Distillate fuel oil	156	38	35
Lubricants, including grease	4	6	6

[e] Estimate.
[1] Data on destinations and origins not reported in detail.

COMMODITY REVIEW

Mineral Fuels.—*Petroleum.*—The major new developments in the petroleum industry were the initiation of offshore oil production by Shell Oil Co. of Qatar Ltd. (Shell) and the start of oil exploration activities by Continental Oil Co. (Conoco) in concession areas relinquished by Qatar Petroleum Co. (QPC) and Shell.

QPC continued to produce about 188,500 barrels per day of 41° API gravity crude from its Dukhan field on the western part of the peninsula. Production was from 48 wells completed in Jurassic limestone at an average depth of 6,500 feet. One exploration well, about 12 miles northwest of Umm Said at Musaymir, was drilled to 12,030 feet by QPC and abandoned. A miscible gas injection project to increase petroleum recovery and maintain pressure in the Dukhan field was begun. QPC utilizes about 30 percent of the 200 million cubic feet per day of gas produced with the crude oil.

Shell produced 30,000 barrels per day from 12 wells in the offshore Idd al Sharqi field about 10 miles south of Halul Island. Production was from Jurassic limestone zones at depths from 4,800 to 8,100 feet. Temporary loading facilities, consisting of a production platform and a single point moored "dead" tanker, are used to store and load export tankers. Shell continued development of the Maydam Mazam field, a 1963 discovery about 12 miles northeast of Idd al Sharqi, and began construction of permanent terminal and loading facilities on Halul Island to handle up to 150,000 barrels per day. Completion of the offshore complex was scheduled for mid-1966.

Conoco began seismic exploration of land areas in its concession area and was expected to begin drilling operations during 1965.

The proved oil reserves in Qatar were estimated [2] to total approximately 3,500 million barrels.

TRUCIAL STATES

Petroleum exploration and development was the only important mineral industry activity in the seven sheikdoms of Abu Dhabi, Dubai, Sharjah, Ajman, Umn al-Qaiwain, Ras-al-Khaimah, and Fujairah, also referred to as the Trucial Coast. To date, commercial oil production has been established only in Abu Dhabi, the largest of the Trucial States. Its output of 184,000 barrels per day in 1964 placed it seventh among Middle East producing countries. Additional wells were drilled in the search for oil in offshore and onshore areas of the Trucial Coast.

Petroleum was the only major industrial activity of the area and the source of nearly all revenues and foreign exchange earnings of the various states. In 1964, total government revenues were an estimated $20 million. The industry provided employment for an estimated 2,500 persons.

PRODUCTION AND TRADE

Although small quantities of iron oxide and simple building materials were produced, production data are available only on crude oil output from this area. Commercial oil production, all of it from Abu Dhabi, averaged about 184,300 barrels per day in 1964. This was nearly four times the output of 1963 and resulted from the first full year of production from the onshore Murban field. Murban was placed on production in December 1963 following the completion of oil handling and port facilities. Offshore production averaged about 61,000 barrels per day while onshore production was 123,300 barrels per day.

---

[2] Oil and Gas Journal. V. 62, No. 52, Dec. 28, 1964, p. 106.

All crude oil was exported and these exports accounted for more than 95 percent of the value of all exports, which were valued at an estimated $125 million in 1964. Reexports from the port of Dubai, the major population and trade center of the area, made up the balance of exports.

The Trucial Coast enjoyed a minor boom in economic growth as a result of the increased oil activities. Imports into Dubai climbed to an estimated $41.7 million in 1964, 70 percent higher than in 1963. No official statistics on mineral imports are available, but building materials for expanding construction activities comprised much of the tonnage. It is reported that 100,000 tons of cement was imported in 1964. The port of Dubai reportedly was capable of receiving imports totaling 600 tons per day and 192,000 tons were landed during the year. A lively resurgence of the gold trade was reported and may account for 20 percent of the value of all imports.

TABLE 3.—Trucial Coast and Muscat and Oman: Production and imports of petroleum and its products

(Thousand 42-gallon barrels)

Commodity	1961	1962	1963	1964
Production (Abu Dhabi):				
Petroleum, crude	447	5,551	[r] 17,571	67,465
Imports:				
Petroleum refinery products:				
Gasoline	NA	[e] 84	[e] 120	[e] 160
Kerosine	NA	[e] 32	[e] 25	[e] 20
Distillate fuel oil	NA	[e] 76	[e] 130	[e] 190
Lubricants	NA	[e] 4	[e] 6	[e] 8

[e] Estimate. [r] Revised. NA Not available.

COMMODITY REVIEW

Mineral Fuels.—*Petroleum.*—All commercial oil production came from the offshore Umm Shaif and the onshore Murban fields of Abu Dhabi. Abu Dhabi Marine Areas Ltd. (ADMA), owned two-thirds by British Petroleum Co., Ltd., and one-third by Cie. Française des Pétroles, produced an average of 61,000 barrels daily from 26 producing wells at Umm Shaif. Crude oil was from Jurassic and Cretaceous limestones at depths of 5,500 to 9,000 feet. Crude was gathered and piped to a terminal on Das Island about 20 miles west of the field. ADMA drilled two appraisal wells to assess its 1963 discovery at Zakum, about 50 miles southeast of Umm Shaif. Oil was reportedly found there in the same zones that produced at Umm Shaif. Exploration was continued in other areas of the offshore concession. Drilling was in progress at a location 18 miles west-southwest of Das Island. Onshore, Abu Dhabi Petroleum Co. (ADPC), an Iraq Petroleum Co. group subsidiary, began the first export of Murban field crude on December 15, 1963, and produced an average of 123,300 barrels daily in 1964 from 24 wells. Although the field is only 12 miles from the coast, lack of a suitable harbor required that Murban crude be transported 70 miles west to a terminal at Jebel Dhanna via a 24-inch pipeline and loaded into tankers through submarine lines to berths 3 miles at sea.

ADPC developed the Bu Hasa area of the Murban field. Nine development wells were completed in 1964 and one well was drilling at yearend. Murban oil is light (42° API gravity) and is from Cretaceous limestones at depths of 8,000 to 9,000 feet. Three exploration wells were drilled in the western part of Abu Dhabi and all were abandoned. They were Mushash 1, Salabikh 1, and Bida Hamamall, drilled to depths of 12,389, 10,785, and 16,579 feet, respectively. A fourth well at Asab was drilling at 7,738 feet at yearend. The crude oil reserve of Abu Dhabi was estimated to be 7,700 million barrels.[8]

In Dubai, oil exploration in onshore and offshore areas was carried on actively by Dubai Petroleum Co., a subsidiary of Continental Oil Co. (Conoco) and others. The offshore concession was held by Conoco (35 percent), British Petroleum Co. (33⅓ percent), Cie Française des Pétroles (16⅔ percent), Deutsche Erdöl (10 percent), and Sun Oil Co. (5 percent). Onshore, it was held by Conoco (55 percent), Deutsche Erdöl (22.5 percent), and Sun Oil Co. (22.5 percent). Conoco was the operator in both areas. In 1964, one offshore well was drilled to 6,730 feet and abandoned following unusual drilling problems. Onshore at Qamar, a well was drilled to a depth of 15,405 feet without finding commercial oil. At yearend, a well in the southeast corner of the sheikdom at Remah was drilling at about 6,000 feet.

In the adjoining states of Sharjah, Ajman, and Umm al-Qaiwain, petroleum exploration operations were conducted by John W. Mecom in concessions held in partnership with Pure Oil Co. In Sharjah's offshore area, a well drilled at Abu Musa was abandoned as a dry hole early in 1964. An onshore well at Hemriyyah in Sharjah was drilled to nearly 15,000 feet but encountered no significant oil or gas shows. Drilling operations were suspended for the remainder of the year.

In March 1964, Union Oil Co. of California and Southern Natural Gas Co. acquired a joint exploration concession in Ras-al-Khaimah. Geophysical exploration was begun in onshore and offshore areas of the concession.

Negotiations for oil concessions in the sheikdom of Fujairah were continued but no definite agreements were announced.

MUSCAT AND OMAN

The Sultanate of Muscat and Oman (including Dhofar) has no established significant mineral industry but has been the scene of petroleum exploration activity for several years. Petroleum Development Oman Ltd., owned 85 percent by Royal Dutch Shell and 15 percent by Participations and Exploration Co. (Partex), announced on November 3, 1964, that oil found in the Natih, Yibal, and Fahud area was sufficient for commercial production. Company officials announced a $70 million program to develop the fields and construct a 156-mile pipeline, storage tanks, tanker mooring buoys and related facilities required to export up to 150,000 barrels of crude oil per day.

---

[8] Page 106 of work cited in footnote 2.

The pipeline will run from the Natih-Fahud area across the Jebel Akdar Mountains (at elevations up to 2,000 feet) to Saih-el-Malik on the Gulf of Oman near Muscat town. Completion of the pipeline, expected by mid–1967, will permit export of Oman crude at an initial rate of about 50,000 barrels per day. Eight producing wells have been completed in Cretaceous strata at depths of several thousand feet. The crude is reported to be sweet with a gravity of about 30° API. Two rigs were in operation drilling additional exploratory and appraisal wells. Oil reserves totaling 500 million barrels were estimated.[4]

In the Dhofar area of the Sultanate, Mecom Oil Co. in partnership with The Pure Oil Co. carried on limited drilling in the 32,000-square-mile concession. A well drilled to a depth of 9,000 feet at a site about 75 miles northeast of Sallalah was abandoned as dry. Exploration and drilling activity was suspended pending a further evaluation of the commercial possibilities of the oil deposits previously found at Marmul.

FEDERATION OF SOUTH ARABIA

The Federation of South Arabia is composed of Aden Colony, a 75-square-mile enclave having a natural deep harbor, and 14 of the 26 sheikdoms of the East and West Aden Protectorates. The area of the Federation of South Arabia is about 135,000 square miles, but Aden Colony was the only part having significant mineral production or trade. The economic importance of Aden comes from its being a major petroleum refining center and bunkering port on the main shipping route from the Near East to Europe. The only other commercial mineral industry activities were the production of salt from sea water in Aden and petroleum exploration in the East Aden Protectorate.

Aden served as an entrepôt for trade with Yemen and other nearby Arabian and East African States. In 1964, the estimated value of all trade was $485 million, with trade in petroleum and petroleum products accounting for about 56 percent of total trade. The mineral industry was the largest source of government revenues, other than subsidies from the United Kingdom, and provided about 40 percent of Aden's total gross national product of an estimated $170 million. Petroleum products accounted for essentially all of the value of mineral production with salt contributing only about 0.1 percent. The mineral industry provided about 25 percent of industrial employment with about 2,000 persons in petroleum refining, 1,200 in bunkering, and 200 in salt production.

GOVERNMENT POLICIES AND PROGRAMS

The economy of the Federation of South Arabia was largely dependent on the petroleum refinery and port activities, military base operations, and the level of British assistance. This assistance increased steadily from July 1963 through yearend 1964 and is expected to be maintained at a relatively high level. Major development projects at the port were completed during 1964, including three new dolphin bunkering berths.

---

[4] Page 106 of work cited in footnote 2.

PRODUCTION AND TRADE

The British Petroleum Co. (Aden) Ltd. refinery operated near its throughput capacity of 136,000 barrels daily. Output of refined products during 1964 was about 5 percent greater than that in 1963.

TABLE 4.—Federation of South Arabia:[1] Production of minerals

Commodity	1960	1961	1962	1963	1964
Nonmetals:					
Salt metric tons	102,897	118,132	78,000	^{r}86,360	81,280
Mineral fuels:					
Petroleum refinery products (thousand 42-gallon barrels):					
Gasoline	3,315	4,122	3,760	3,463	3,393
Jet fuel and kerosine	2,502	4,083	5,092	5,430	6,112
Distillate fuel oil	6,133	7,811	8,703	9,356	9,479
Residual fuel oil	15,169	17,987	21,258	25,327	23,584
Other refined products	2,048	2,920	3,617	3,262	4,083
Refinery fuel and loss	1,857	2,109	2,488	2,574	3,252
Total	31,024	39,032	44,918	49,412	49,903

[1] All recorded production is from Aden Colony.
^{r} Revised.

In 1964, exports of refinery products (excluding bunkers) were valued at an estimated $90 million. A total of 6,801 vessels of all types were supplied with 3.9 million tons of bunkers valued at about $67.5 million. British Petroleum Co., Ltd. supplied about 70 percent of the bunkers; Mobil Oil Co., 20 percent; and Caltex Oil Co., 10 percent. About half the Mobil share in bunkering was for Esso, Mediterranean, Inc., which was scheduled to complete its own $600,000 facility in 1965.

TABLE 5.—Federation of South Arabia: Exports and reexports of metals and minerals from Aden[1]

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964
Metals:			
Iron and steel	^{r}1,147	671	NA
Nonmetals:			
Cement	^{r}5,659	4,152	NA
Salt	^{r}101,350	73,739	^{e}70,000
Mineral fuels:			
Petroleum refinery products (thousand 42-gallon barrels):			
Gasoline	7,096	3,145	4,663
Kerosine and jet fuel	4,400	4,804	4,898
Distillate fuel oil	2,353	6,467	6,686
Residual fuel oil	10,722	10,948	11,631
Other, including LPG and feedstocks	----------	3,244	2,996
Bunkers	25,306	27,650	^{e}28,990

^{e} Estimate. ^{r} Revised.
[1] Destinations not available.

Source: Federation of South Arabia Trade Bulletin (except for petroleum). January 1964, 8 pp.

Imports of minerals and metals in 1964 were valued at an estimated $135 million, or about 45 percent of the value of all imports. Crude oil and petroleum products accounted for 98 percent of the value of mineral imports.

TABLE 6.—Federation of South Arabia: Imports of selected metals and minerals to Aden

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Metals:				
Iron and steel	[r] 9,692	10,070	NA	NA.
Nonmetals:				
Cement	[r] 83,036	77,763	NA	NA.
Salt	[r] 46	30	NA	NA.
Mineral fuels:				
Coal	—	1,266	NA	NA.
Petroleum:				
Crude (thousand 42-gallon barrels).	46,684	46,935	50,080	Iran 21,251; Kuwait 14,706; Abu Dhabi 6,967; Qatar 3,571; Iraq 3,571; Saudi Arabia 337.
Refined products (thousand 42-gallon barrels):				
Gasoline	294	306	510	NA.
Kerosine and jet fuel	6	NA	158	NA.
Residual fuel oil	7,710	10,976	4,283	NA.
Lubricants [e]	12	12	12	NA.

[e] Estimate. [r] Revised. NA Not available.

COMMODITY REVIEW

Nonmetals.—*Salt.*—The production of salt by the Indo-Aden Salt Co. declined by about 6 percent in 1964 because of increased labor costs and continuing low salt prices. This company was the only remaining salt company in operation in Aden. Most of the production was exported to Japan, but small quantities were shipped to east African countries.

Mineral Fuels.—*Petroleum.*—The British Petroleum (Aden) Ltd. refinery operated at near capacity, processing about 136,000 barrels per day of imported crude. This was about a 5-percent increase over the processing rate of 1963. There were no plans for increasing the capacity of the refinery.

The American International Oil Co., a subsidiary of Standard Oil Co. of Indiana, actively conducted petroleum exploration operations in its East Aden Protectorate concession. The company completed the drilling of its first well at Wadi Thuf in October. The well proved dry and drilling was stopped at a depth of 3,900 feet. Drilling of a second well in this general area was to begin in early 1965.

YEMEN

Yemen, with an area of about 75,000 square miles in the southwestern corner of the Arabian peninsula, remained almost totally undeveloped as an industrial society. The only significant mineral industry activities have been the exploitation of salt deposits and petroleum exploration. Building stone, limestone, gypsum, steatite, and agate were quarried for domestic consumption.

In September 1962, Yemen's centuries-old Imamate regime was overthrown by a military coup, and the Yemen Arab Republic established. The country has been in revolution and armed conflict since that time. The revolution has had a marked effect on the nation's economy. Previously a closed society, the presence of foreign troops and substantial foreign economic assistance have stimulated certain sectors of the economy.

GOVERNMENT POLICIES AND PROGRAMS

Despite the interruptions caused by revolution, a number of development programs were changing the social, commercial, and industrial status of Yemen. A major project in 1964 was the continued construction of a 225-mile gravel-surfaced road from Mocha to Sanaa via Taiz under U.S. Agency for International Development auspices. The Hodeida port facilities, constructed under a Soviet aid agreement, provided Yemen with its only major port and diverted some trade that previously moved through Aden. Building activity reached boom proportions in Hodieda and in Taiz. The Hodeida-Sanaa highway, completed by mainland China as an aid project in 1961, continued to be the only paved road in Yemen, but the Chinese have agreed to construct a second road from Sanaa to Saada.

The Government announced a new foreign investment law, providing tariff and tax exemption, to encourage economic development. Increased trade between Yemen and East European countries was stimulated by barter and commodity-loan agreements.

PRODUCTION AND TRADE

Yemen's only significant mineral production in recent years has been rock salt. A Japanese concession to purchase 100,000 tons annually of this salt for 5 years expired in February 1964. The concession was not renewed and no additional salt was exported during the remainder of 1964. Salt production has been reported as follows:

Year:	*Quantity (metric tons)*	*Year:*	*Quantity (metric tons)*
1959	100,000	1962	150,000
1960	100,000	1963	100,000
1961	120,000	1964	e 35,000

e Estimate.

No detailed trade statistics are available; however, all exports in 1963 were valued at an estimated $5.5 million. The only mineral exported was salt, which was valued at an estimated $350,000.

Imports of minerals and metals in 1963 were valued at an estimated $3.7 million or about 25 percent of all commercial imports. Major mineral imports and estimated values were cement ($1.7 million); petroleum refinery products ($1.5 million); iron and steel ($0.5 million).

COMMODITY REVIEW

Nonmetals.—*Salt.*—Large deposits of high-quality (96 to 98 percent sodium chloride) rock salt are located on the coast at Salif. Salt production from the open-pit mine was severely limited by lack of mechanized mining equipment, and of port facilities which made it necessary to load ships from lighters. These difficulties reportedly rendered the Salif operation uneconomic. All salt produced was sold to Japan under a 5-year contract that expired in February 1964. The contract was not renewed but a joint Yemen-United Arab Republic salt production and mining company was established on July 31 to exploit the deposits. Negotiations were underway at yearend to resume production.

Mineral Fuels.—*Petroleum.*—In February 1961 John Mecom, an independent U.S. oil operator, concluded an agreement with the Yemen Government for oil exploration rights in the Tihama coastal plain area. During 1961 and 1962, five wells were drilled in the Salif-Hodieda area to depths from 5,000 to 10,000 feet. All wells were nonproductive of oil or gas and were abandoned. In June 1963, oil exploratory activities were discontinued by Mecom.

In July 1964, the Yemen Petroleum Co., a government-owned petroleum distribution monopoly, was reorganized as a joint Yemen-United Arab Republic venture. It was reported that this company was assigned petroleum exploration rights throughout Yemen, but it has not implemented these rights to date.

Regional Mineral Industry Review of South Asia

By James A. West[1]

◆

THE South Asian countries of India, Ceylon, Pakistan, Afghanistan, Nepal, Bhutan, and Sikkim have a large variety of mineral resources; however, in spite of mineral industry growth during 1964, development of resources remained far short of possible development, and, in terms of value of trade in minerals, the area remained a sizeable net importer.

India's mineral industry is by far the most significant; its minerals production in 1964 accounted for more than 90 per cent of the total value of all minerals produced in the area. The total value of all minerals produced in South Asia in 1964 was only about 1 percent of the area's estimated gross national product of $55,125 million. Despite the rather small current contribution of minerals to the economy, development of mineral resources figures prominently in plans for the industrial development of the nations of this area.

India has outstanding resources of high-grade iron ore, manganese ore, bituminous coal, ilmenite, monazite, and mica. Pakistan has large natural gas reserves in both the east and west sections of the country. Also, Pakistan has locally significant salt, fire clay, gypsum, limestone, and chromite deposits. Mineral development in Afghanistan has been extremely limited; however, it is known to have important natural gas and coal deposits. Ilmenite, graphite, and gem stones remained as Ceylon's most important mineral resources. Nepal, Bhutan, and Sikkim produced no commercially significant quantities of minerals in 1964.

South Asian countries' share of total world output of certain minerals was as follows: Mica 16.2 percent; manganese ore 8.4 percent; and salt 5.2 percent; for bauxite, chromite, ilmenite, iron ore, pig iron, ingot steel, cement, graphite, gypsum, magnesite, and coal the percentages ranged from 1.5 to 2.8. South Asia contributed significantly to other world-area requirements for iron ore, manganese ore, ilmenite, mica, and rare earth compounds. Exports of all mineral commodities were valued at an estimated $170 million. Countries of the area were dependent on imports for most base metals, petroleum, fertilizers, and many other mineral commodities. Imports of all metals and minerals were valued at about $800 million, with crude oil and petroleum products accounting for more than 40 percent of the total value.

---

[1] Chief specialist, Near East-South Asia, Division of International Activities.

The most important mineral-industry developments in 1964 were the continued efforts by various governments to develop mineral resources or expand raw materials' output to meet the growing demands of their industrial and economic development. In India, a large iron-ore project being developed for export was commissioned; new agreements were reached for expanding existing steel plants and for the construction of a fourth public-sector steel plant; and major projects to increase or expand petroleum production and refining, cement, coal, aluminum, copper, lead-zinc, and other mineral-industry capacity were continued. One result of these efforts was a continued surplus of coal. In Pakistan, development of natural-gas resources was continued and progress was made in establishing a domestic steel plant. In Ceylon, production of ilmenite increased sharply, and a significant gain in graphite output was realized. Afghanistan continued the development of natural gas and coal resources with substantial foreign financial and technical assistance.

The Mineral Industry of Afghanistan

by James A. West[1]

◆

AFGHANISTAN'S mineral industry remained a small segment of the nation's economy in 1964, as was the case in 1963, when the value of all mineral production was believed to be less than 0.5 percent of the estimated gross national product of $1,100 million. The mineral industry employed about 2,000 workers.

Coal and cement were the most significant mineral commodities produced in 1964. Salt, barite, and minor building material were produced for local consumption, and some lapis lazuli was produced for export.

The country has significant reserves of natural gas, which have been delineated with financial and technical assistance from the U.S.S.R. Plans were implemented for construction of pipelines and plants to export 50 billion cubic feet of natural gas annually to the U.S.S.R. and to utilize 20 billion cubic feet annually for local consumption.

GOVERNMENT POLICIES AND PROGRAMS

The Government of Afghanistan continued programs to develop and expand the mineral industry. Under the second 5-year plan (1961–62 to 1965–66[2]), the cost of planned projects for mineral industry development totaled about 10 percent of all industrial investment programs. Expenditures for geological surveys, expansion of coal production, development and utilization of natural gas resources, and other mineral industry projects during 1964 were estimated at about $9 million.

The Government continued to receive substantial foreign financial and technical assistance in the development of mineral resources. In 1964, the Government announced agreements with the U.S.S.R. for construction of a nuclear reactor for peaceful uses and establishment of a polytechnic institute at Kabul. The new institution will have colleges of architecture, mining engineering, electrical engineering, and petroleum engineering. The complex of buildings for classrooms, workshops, laboratories, and dormitories to accommodate 1,500 students are to be completed in 3 years at a cost of about $10 million. U.S. Agency for International Development (AID) assistance in coal mine development was continued.

---

[1] Chief specialist, Near East and South Asia, Division of International Activities.
[2] Afghan calendar years are from March 21 to March 20 of succeeding year.

PRODUCTION

Significant gains in output of coal and cement, which are Afghanistan's most important minerals products, contributed to the overall increase in the estimated value of listed mineral production to $4.6 million in 1964. In addition to commodities listed, Afghanistan is known to have produced some limestone, marble, gypsum, talc, and clays, but data are insufficient to make quantitative estimates of production.

TABLE 1.—Afghanistan: Production of selected metals and minerals

Commodity	1960	1961	1962	1963 [1]	1964 [1]
Metals:					
Beryl .... kilograms	10,000	------	------	------	500
Nonmetals:					
Barite .... metric tons	------	------	NA	[r] 1	2
Cement .... thousand metric tons	37	41	[e] 70	95	[e] 125
Lapis lazuli .... kilograms	[2] 2,800	[2] 3,268	[2] 2,823	5,421	5,000
Salt:					
Rock .... thousand metric tons	26	23	22	21	13
Other .... do	[e] 50	66	65	12	12
Total .... do	76	89	87	33	25
Mineral fuels: Coal:					
Bituminous .... do	46	68	69	98	113
Briquets .... do	[e] 20	19	[e] 19	[e] 20	[e] 20

[e] Estimate.
[r] Revised.
NA Not available.
[1] Data for Afghan calendar year beginning Mar. 21.
[2] Data for Afghan fiscal year, beginning Sept. 21.

TRADE

Afghanistan's exports of minerals during 1964 were insignificant, and the country continued to be dependent on imports for essentially all its requirements for metals, petroleum products, and many nonmetallic minerals. The value of imports by major classes of mineral commodities for the 2 most recent Afghan calendar years was as follows:

Class	Value (thousand dollars)	
	1961–62 [1]	1962–63 [1]
Metals and metal manufactures [2]	2,210.5	671.3
Nonmetals and nonmetallic mineral manufactures [2]	3,285.7	1,608.6
Petroleum products	7,380.5	7,137.8
Total	12,876.7	9,417.7

[1] Afghan calendar year beginning Mar. 21.
[2] As reported; may include advanced manufactures not usually reported as mineral and/or metal industry products.

These mineral and metal import values accounted for 8 percent of the value of all imports during 1962–63. The U.S.S.R. continued to be the principal source of Afghanistan's imports, accounting for about 63 percent of the value of all imports. Data on quantities of mineral imports are available only for petroleum products.

TABLE 2.—Afghanistan: Imports of petroleum refinery products

(Thousand 42-gallon barrels)

Commodity	1961–62 [1]	1962–63 [1]	Principal sources, 1962–63
Gasoline	807	738	U.S.S.R. 555; Iran 115; United States 68.
Kerosine	45	50	Iran 27; U.S.S.R 22.
Diesel fuel oil	198	233	U.S.S.R. 174; Iran 58.
Lubricants	50	17	United States 11; U.S.S.R. 4; Iran 1.
Total	1,100	1,038	

[1] Afghan calendar year beginning Mar. 21.

COMMODITY REVIEW

METALS

Beryl.—The Afghan Ministry of Mines and Industries announced that a U.S.S.R. mineralogical survey team discovered two new beryl deposits in the Noor and Paich valleys on the eastern side of the Kunar River. These deposits are in the same general area of Ningrahar province where beryl was discovered in 1963. It was reported that the beryl content of the ore varies from 0.2 to 0.6 percent. The reserve was estimated to be 120,000 tons of ore. The presence of beryl in Afghanistan has been known for many years, but only limited quantities have been mined.

Iron Ore.—The reportedly extensive and rich deposits of iron ore in the remote Hindu Kush Mountains, 120 kilometers northwest of Kabul, remained a potentially important but undeveloped resource. Although investigations of the deposits continued, no new developments were reported.

Other Metals.—Chromite, copper, lead-zinc, and gold deposits occur in remote areas of Afghanistan. Commercial exploitation was being considered but development has not been undertaken because of inaccessibility, lack of domestic markets, and the large investments required to develop these deposits and transport output to world markets.

NONMETALS

Barite.—The Ministry of Mines announced in November 1964 that several promising barite deposits had been found on the northern slopes of the Hindu Kush Mountains in the Ghorband, Hagigak, and Khanabad areas. Plans were announced for mining sufficient quantities to meet all oil and gas well drilling requirements, beginning as soon in 1965 as weather conditions permit.

Cement.—Two plants with a total installed capacity of 500 tons per day continued to supply all domestic requirements in 1964. The Ghori plant near Pul-i-Khumari had two kilns, each with a capacity of 200 tons per day. The other plant, at Jabal-i-Seraj, had a single 100-ton-per-day kiln. There were no immediate plans to increase cement production capacity.

Lapis Lazuli.—Mining of this semiprecious gem stone, carried on intermittently for centuries, continued through 1964. The principal operating deposits were in Badakhshan province of northern Afghanistan. Lapis lazuli occurs in a metamorphosed limestone, and much of it is impregnated with limestone. The Ministry of Mines and Industries reported that in the calendar year ending March 20, 1962, a total of 4,000 kilograms, valued at $250,000, was exported.

Salt.—There are extensive salt domes near Tallequan and Andkhui in north Afghanistan. Rock salt has been mined at Tallequan for many years. Brine lakes near Mukhar and south of Herat have been regularly worked in summer months to provide salt for local use. Primitive mining methods and lack of transportation have severely limited output.

MINERAL FUELS

Coal.—Coal continued as the only significant mineral fuel resource that has been developed and utilized in Afghanistan. During 1964, the Karkar and Ishpushta mines continued to supply most of the country's coal requirements. Coal was utilized as fuel in Afghanistan's two cement plants and in the Kabul area. Karkar and Ishpushta coal is of poor quality, and reserves are estimated at only about 26 million tons. There are coal deposits of higher quality containing an estimated reserve of 60 million tons in the more remote Dari Suf area of north-central Afghanistan, about 400 miles from Kabul. Development of a mine at Dari Suf with U.S. assistance continued. Completion of this mine development and the necessary roads may eventually permit an annual output of 150,000 tons from this area.

On June 14, 1964, the Karkar mine suffered a severe explosion which took the lives of 74 miners and caused extensive damage to the mine.

Petroleum and Natural Gas.—In recent years, significant natural gas and minor oil deposits have been discovered in the Shibarghan area of north-central Afghanistan. Oil and gas exploration activities are conducted by the State Petroleum Exploration Co. of the Ministry of Mines and Petroleum with financial and technical assistance from the U.S.S.R. Major gasfields were discovered at Khwaja Gogirdak and Yatime-Taq in Cretaceous formations at depths of 2,400 to 6,000 feet. Development of these fields was continued in 1964, and at yearend the Khwaja Gogirdak and Yatime-Taq had a total of eight and five wells, respectively. Proved gas reserves were estimated to total 2,200 billion cubic feet. Further exploration for oil and gas was continued in areas adjoining the Shibarghan fields. At Khoja Bolan, a deep well found gas and condensate in the upper Cretaceous formation. At Andkhoi, two wells drilled through Cretaceous formations were nonproductive.

In accordance with the terms of an agreement between the Government of Afghanistan and the U.S.S.R., plans for utilization of natural gas reserves moved forward. A site was selected near Mazar-i-Sharif for construction of a chemical fertilizer plant and a thermal powerplant. These plants will utilize about 20 billion cubic feet of natural gas annually. About 50 billion cubic feet of natural gas will be exported annually to the U.S.S.R. via a 60-mile pipeline from the gasfields to the Soviet border. Construction of the pipeline and the plants is expected to begin in 1965.

The Mineral Industry of Ceylon

By E. Shekarchi[1]

❖

CEYLON'S significant contribution to the world mineral supply in 1964 continued to be ilmenite and graphite. The ilmenite industry for the first time ranked ahead of the graphite and semiprecious gem stone industries in value. The 1963 value of Ceylon's ilmenite and graphite output was estimated at $1.3 million,[2] or about 0.08 percent of gross national product (GNP). Per capita GNP in 1963 remained at $139 as in the previous year, although the total GNP based on 1962 prices showed about 3.5-percent increase, thus directly reflecting the population growth rate. The mineral industry provided employment for about 15,000 persons in 1964, almost one-third of whom were seasonal laborers.

Fertilizers and iron and steel, valued at approximately $24 million, constituted about 8 percent of the total imports. On the basis of available export values, ilmenite and graphite constituted only 0.4 percent of the exports.

GOVERNMENT POLICIES AND PROGRAMS

The Government's direct participation in business increased significantly in 1964. This increase was evidenced by its grant of monopoly rights for internal petroleum product distribution to the Government-owned Ceylon Petroleum Corp. Effective August 1964, the Government imposed a 5 percent ad valorem duty on the export of precious and semiprecious stones. This tariff applies not only to commercial exports but also to gem stones purchased in Ceylon by visitors.

Controller of Imports and Exports, Ministry of Internal and External Trade, in a budget proposal presented in 1964, suggested that the existing open general license law be abolished. Under the proposed act, individual licensing would be extended to all imports. Only imports by the controller would remain unlicensed.

The development of water resources of the Mahaweli Gang Basin in north-central Ceylon was undertaken in a joint effort between the United Nations Special Fund and the Government of Ceylon. The plan called for a comprehensive report on the irrigation and hydropower potentials of the basin. Accordingly, the United Nations will provide $1,050,000 to cover foreign exchange and cost of the report, and the Government will provide approximately $1 million in local currency for personnel and equipment for the survey. The survey is expected to be completed in 4 years.

---

[1] Foreign minerals specialist, Division of International Activities.

[2] Values have been converted from Ceylonese rupees (CRs) at the rate of CRs 1=US$0.21.

PRODUCTION

The mineral industry experienced a significant increase in production in 1964. Ilmenite production practically doubled because of improved mining facilities and export market conditions. According to preliminary reports, graphite production was the highest that it has been for the last 5 years. Production of cement, kaolin, and glass sand improved slightly. Although quantitative data on gem stone output are not available, production has generally exceeded recorded exports, which in 1964 were valued at about $270,000.

TABLE 1.—Ceylon: Production of metals and minerals

(Metric tons)

Commodity [1]	1960	1961	1962	1963	1964 [e]
Metals:					
Ilmenite	6,350	10,160	4,220	19,088	46,000
Monazite	335	216	------------	------------	50
Nonmetals:					
Cement	84,965	81,765	84,781	75,238	75,000
Feldspar	33	108	57	111	50
Glass sand	2,357	1,941	3,932	4,339	4,000
Graphite (exports)	9,169	9,086	8,769	8,447	11,000
Kaolin	NA	NA	NA	1,016	1,500
Salt	56,449	34,544	46,529	20,446	40,000

[e] Estimated. NA Not available.

[1] Ceylon also produces a wide variety of precious and semiprecious gems but no reliable data on output are available.

TRADE

The value of minerals and metals exports in 1963 was about $1.2 million. Quantitative export figures on precious and semiprecious stones were not available for 1963. In this connection, the Government announced the formation of a State Gem Mining Corporation intended partly to improve and control external and internal trade in gems. It is the intention of the corporation to levy license fees on all gem pits and to impose taxes on all sections of the gem industry. The additional revenue expected has been estimated at $2.1 million per year.

Requirements for iron and steel, all nonferrous metals, many nonmetallic minerals, and all mineral fuels were supplied by imports. Total import value of minerals and metals was estimated at $34 million in 1963. The largest segment of imports by value was iron and steel and fertilizer.

TABLE 2.—Ceylon: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals: Ilmenite ore and concentrates	2,794	20,176	Japan 16,408; France 2,540; Spain 1,200.
Nonmetals:			
Gems, precious and semiprecious carats	227,803	NA	NA.
Graphite	8,768	8,419	United States 2,422; United Kingdom 2,318; Japan 1,818.

NA Not available.

TABLE 3.—Ceylon: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys, all forms	2,927	3,031	United Kingdom 2,328; Hong Kong 300; Belgium 283.
Antifriction metals	47	138	United Kingdom 103; Denmark 30.
Copper and alloys, all forms	425	1,039	Union of South Africa 389; United Kingdom 277; West Germany 273.
Gold troy ounces	11,945	11,940	All from United Kingdom.
Iron and steel:			
Pig iron	595	528	All from United Kingdom.
Steel ingots	4,456	2,002	Belgium 722; United Kingdom 607; U.S.S.R. 219.
Semimanufactures	72,025	62,596	United Kingdom 18,920; Japan 14,115; Belgium 11,068.
Lead and alloys, all forms	[r] 262	439	All from United Kingdom.
Silver troy ounces	19,751	18,032	All from United Kingdom.
Tin and alloys, all forms	45	66	Austria 25; United Kingdom 25.
Zinc and alloys all forms	162	220	West Germany 43; United Kingdom 41; U.S.S.R. 40.
Nonmetals:			
Abrasives	77	344	Belgium 323; United Kingdom 17.
Asbestos, all forms	2,258	3,817	Czechoslovakia 2,473; Belgium 978; United Kingdom 213.
Cement thousand tons	213	203	Japan 65; Mainland China 40; Poland 37.
Clays	907	1,338	United Kingdom 1,327.
Fertilizers:			
Nitrogenous	173,407	169,088	United Kingdom 128,632; Japan 18,495; U.S.S.R. 14,722.
Phosphatic	54,631	73,401	Egypt 58,040; Jordan 9,195; Tunisia 6,096.
Potassic	39,468	62,114	France 42,079; West Germany 15,896; Sweden 3,843.
Other	9,637	15,574	West Germany 10,604; Republic of South Africa 1,979.
Salt thousand tons	56	37	All from India.
Stones, all types	154	390	Italy 269; India 106.
Sulfur	973	4,120	United States 1,095; Belgium 1,095; West Germany 1,016.
Talc	2,226	1,914	India 1,438; Mainland China 247; Italy 228.
Mineral fuels:			
Coal thousand tons	[r] 141	145	Republic of South Africa 127; Australia 16.
Coke do	[r] 539	608	United Kingdom 305; Australia 303.
Petroleum refinery products:			
Gasoline thousand barrels	1,292	1,193	Iran 720; U.S.S.R. 268; Bahrain 164.
Kerosine do	1,348	1,089	Iran 508; U.S.S.R. 412; Bahrain 107.
Distillate fuel oil do	1,660	1,359	U.S.S.R. 575; Iran 151; Bahrain 69.
Residual fuel oil do	482	487	U.S.S.R. 331; Iran 121; Bahrain 33.
Lubricants do	95	118	United States 68; United Kingdom 43.
Asphalt do	28	46	Iran 21; Iraq 4.
Total do	4,905	4,292	

[r] Revised.

COMMODITY REVIEW

METALS

Ilmenite.—Production at the up-to-date and fully mechanized plant at Pulmoddai on the east coast of Ceylon was about 40,000 metric tons of ilmenite. The ilmenite industry was operated solely by the government-sponsored Ceylon Mineral Sands Corp. The ilmenite is concentrated from beach deposits, that average 200 feet in width and extend for about 4 miles. The visible reserve of pure ilmenite has been estimated to be more than 4 million metric tons. Typical beach deposits have a mineralogical composition of 70 to 80 percent ilmenite, 8 to 10 percent rutile, 8 to 10 percent zircon, and 2 to 3 percent quartz and magnesite. The Mineral Sands Corp. was reported to be planning to expand its plant from an annual rate of 60,000 metric tons to 80,000 metric tons per year.

Iron Ore, and Iron and Steel.—Construction of the Oruwela rolling mill, the first phase of a planned integrated steel industry, continued in 1964 and was reported far behind its scheduled completion date of mid-1965. The mill, supplied by the U.S.S.R. on a credit basis, has a planned annual capacity of 10,000 tons of wire rods and 25,000 tons of merchant sections, and reportedly will cost $17 million.

The Geological Survey of Ceylon completed its exploration for iron deposits for internal consumption. A finding was reported in the Chilaw district with an estimated reserve of about 4 million tons assaying between 50 and 65 percent iron.

Base Metals.—As in previous years, Ceylon's entire nonferrous metal requirement in 1963 was imported. The Controller of Imports and Exports informed all nonferrous scrap and metal exporters that the Government would charge an analysis fee of $52.50 before an export license is granted.

NONMETALS

Cement.—The Government-owned Ceylon Cement Corp. supplied 30 to 40 percent of the apparent requirements of the country. Apparently because of the greater demand the Government allocated 40 percent of the total foreign exchange budget of $388 million for cement imports in 1964.

Graphite.—Major graphite mines in the island continued to produce at a level that kept up with the demand for Ceylon's special grades—amorphous, crystalline lump, and chip graphite. Production remained far below the peak year of World War II.

Ceramic Materials.—The Government-owned ceramic plant continued to produce at its annual capacity of 840 tons. A contract was signed between National Small Industries Corp. and Strej-export of Czechoslovakia for the construction of two tile and brick factories. In October the Government opened a tile and brick factory at Alutunwara having a capacity of 5 million roofing tiles per year. Also, the first of five smaller tile factories erected with Czechoslovak aid, each with an annual 2-million-tile capacity, was opened.

Fertilizers.—The Ceylon Fertilizer Corp., established in January, negotiated with the Colombo Commercial Co. to acquire the company's

37-acre fertilizer works situated at Hunupituja, approximately 10 kilometers north of Colombo. The plant has a maximum capacity of 18,000 tons per month, but produced at a rate of only 10,000 tons in 1964. Most of the raw material used in the plant—sulphate of ammonia, ground rock phosphate, potassium chloride, magnesium sulphate, and borate—must be imported. The Government arranged with export agencies to import most of these raw materials on a barter basis in order to save foreign exchange.

MINERAL FUELS

Negotiations continued between the petroleum firms that operated through 1963 in the island and the Government over compensation for the facilities acquired by the Government. Petroleum product imports from the U.S.S.R., nil in 1961, increased to 38 percent of the total imports. This increase ranked Ceylon imports from U.S.S.R. second to imports from Iran.

In October 1964 the Government signed an agreement with the Czechoslovakian State Corporation to build a refinery in the island under a turn-key arrangement. Details of the plant were not published.

SOURCE MATERIAL

Information on the mineral industry of Ceylon was obtained from foreign service dispatches of the U.S. Embassy in Colombo. Trade data were obtained from the official publication, "Statistics on Imports and Exports," issued by the Ministry of Finance. Background information was derived from a wide variety of sources, including Government reports and recent newspaper and magazine articles.

The Mineral Industry of India

By James A. West[1]

◆

THE mineral industry of India continued to be an important part of the national economy and figured prominently in programs to expand the industrial base of the country. India remained a leading world producer and supplier of mica, manganese ore, and iron ore; while its production of salt, iron and steel, coal, cement, bauxite, and gypsum was of world significance. Exports of some of these were important foreign exchange earners for the Nation.

The value of mineral production, exclusive of petroleum and fissionable minerals, was an estimated $431.7 million—equivalent to about 1 percent of the gross national product. Output value declined about 3 percent, compared to that of 1963, largely because of a 5 percent decrease in coal output. As in recent years, coal and lignite accounted for 75 percent of total value; metallic minerals, 13 percent; and nonmetallic minerals, 12 percent. Exports of mineral ores were valued at $159 million, an increase of nearly 20 percent from that of 1963 and about 9 percent of the value of all exports.

An estimated 685,000 workers were engaged in mining and quarrying. Iron and steel plants employed about 200,000 workers; and other metallurgical plants, petroleum operations, and cement plants employed about 100,000 persons. Total mineral industry employment was nearly 7.5 percent of the industrial labor force of 13,400,000 workers.

The three most important mineral industry developments were an agreement between India and the U.S.S.R. for construction of the Bokaro steel plant—to have an initial annual capacity of 1.5 million tons and an ultimate capacity of 4 million tons; commissioning of the Kiriburu iron ore project—developed with financial and technical assistance from the United States and Japan; and a continuing surplus of coal on domestic markets—a condition first noted in 1963.

GOVERNMENT POLICIES AND PROGRAMS

The Government of India continued its policy of being responsible for development of industrial activities, including most mineral industries. The Government encouraged development of mineral resources needed for diversifying and expanding industrial capacity as programed in successive 5-year plans.

---

[1] Chief specialist, Near East-South Asia, Division of International Activities.

A crash program, entitled "Operation Hard Rock," for intensifying efforts to develop mineral resources, was prepared by the Ministry of Steel and Mines.

The Government continued to implement major programs to further development of iron ore, coal, petroleum, manganese, aluminum, copper, lead, zinc, and other resources. Major projects to increase the capacity of the iron and steel, petroleum refining, cement, and coal industries were continued and expanded. Although public sector projects received the most attention, the Government also licensed private industry projects to expand iron and steel, aluminum, copper, lead-zinc, and other mineral industry capacity. Minority equity participation by private firms appears to have become the accepted means of new oil-refinery construction in India.

The Government issued a series of regulatory measures on mica export trade which fixed floor prices for various categories, banned export on a consignment basis, and made preshipment inspection compulsory.

The Indian Government obtained oil concessions outside of India for the first time, becoming a participant with a U.S. and an Italian oil firm in an exploration and production concession in the Iranian offshore area of the Persian Gulf.

Government regulation of the coal industry continued; however, all controls on consumption and movement of coal were removed in an effort to reduce excess stocks.

Also, the Government removed distribution controls from several categories of steel products and set up a Joint Plant Committee of Government and steel plant officials to fix prices for decontrolled categories.

PRODUCTION

Bituminous coal production again exceeded demand, although it was 5 percent less than that of 1963. This decline was largely due to lower consumption stemming from the failure of industrial activities to achieve planned growth levels.

The production of iron ore and most iron and steel categories was nearly the same as in 1963. This was also the case with output of aluminum, bauxite, copper, lead, and zinc. Manganese output increased in response to rising export demand, mostly through barter. Chromite output continued to decline because of decreased export demand.

The value of all nonmetallic minerals produced in 1964 was an estimated $51 million, 13.5 percent less than the 1963 total. Cement continued in short supply, despite an output of nearly 4 percent more than in 1963.

In contrast to production of bituminous coal, output of other mineral fuels increased during 1964. Domestic production of crude oil and refinery products increased 35 percent and 12 percent, respectively, from that of 1963. Completion of the first phase of Neyveli thermal power plant resulted in a 58 percent increase in lignite production.

TABLE 1.—India: Production of metals and minerals[1]

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Bauxite……thousand tons	387	476	[r] 573	565	591
Metal	18,255	18,382	35,403	55,208	55,184
Antimony, smelter	812	616	661	909	840
Beryl	907	803	136	NA	NA
Chromite	100,112	45,926	66,648	64,790	33,424
Copper:					
Ore……thousand tons	448	423	492	474	473
Smelter (fire refined)	8,910	8,336	9,780	9,581	9,475
Gold……troy ounces	160,593	156,510	163,326	138,280	147,958
Iron and steel:					
Ore……thousand tons	16,539	18,753	18,802	20,500	20,541
Pig iron……do	4,175	4,987	5,796	6,603	6,593
Ferroalloys……do	93	112	121	138	149
Steel ingots and metal for casting……do	3,286	4,084	[r] 5,042	[r] 5,967	6,032
Finished steel……do	2,226	2,816	3,564	4,257	4,343
Lead:					
Concentrate	6,245	5,532	6,384	5,920	6,148
Smelter	3,745	3,664	2,849	3,537	3,624
Manganese ore					
More than 35 percent Mn……thousand tons	942	873	937	766	867
Less than 35 percent Mn[2]……do	364	357	546	309	396
Mn content not disclosed……do	--------	• 100	--------	• 105	--------
Total	1,306	1,330	1,483	1,180	1,263
Silver, smelter……troy ounces	132,718	191,008	138,698	128,314	152,204
Titanium:					
Ilmenite……thousand tons	250	174	138	26	11
Rutile	982	815	1,616	1,871	1,871
Tungsten (wolfram)	3	10	11	5	[r] 8
Zinc:					
Concentrate	9,787	9,254	10,024	10,627	10,744
Metal content of concentrate	5,400	5,100	5,533	5,860	5,915
Nonmetals:					
Apatite	14,921	20,140	29,018	13,127	4,049
Asbestos	1,711	[r] 1,468	1,692	2,712	2,967
Barite	13,586	15,717	32,662	37,312	46,225
Calcite	9,235	10,885	13,541	13,554	12,862
Cement……thousand tons	7,835	8,245	8,587	9,355	9,690
China clay……do	353	371	390	404	513
Corundum	250	329	301	658	540
Diamonds……carats	1,159	1,313	1,131	1,432	2,260
Dolomite……thousand tons	650	721	901	1,070	507
Feldspar	10,652	[r] 9,073	[r] 19,221	20,933	20,098
Fire clay……thousand tons	258	270	346	368	360
Fluorspar	NA	NA	657	708	389
Garnet	469	241	415	361	255
Gypsum……thousand tons	997	865	[r] 1,124	1,188	880
Kyanite	20,156	27,155	49,618	31,665	34,09'
Limestone……thousand tons	12,728	14,346	16,907	17,057	16,919
Magnesite……do	156	210	213	235	208
Mica, crude	29,226	28,347	28,354	25,098	• 29,800
Ocher	20,400	19,248	17,449	20,991	28,056
Quartz and silica	66,730	97,452	200,350	215,826	226,093
Salt……thousand tons	3,442	3,488	3,895	4,549	4,647
Sillimanite	8,483	8,113	8,255	11,285	12,362
Steatite	93,392	98,793	110,449	117,974	135,306
Vermiculite	215	632	[r] 433	677	423
Mineral fuels:					
Coal……thousand tons	52,593	56,065	61,370	65,927	62,440
Lignite	46,945	63,765	210,748	991,718	1,569,000
Coke, all types……thousand tons	6,722	9,428	9,271	9,762	• 9,600
Petroleum:					
Crude……thousand 42-gallon barrels	3,370	3,356	8,016	12,266	• 16,966
Refinery products:					
Gasoline……do	8,868	9,084	10,381	[r] 12,229	• 13,000
Kerosine……do	7,200	7,864	9,488	[r] 11,536	• 12,100
Distillate fuel oil……do	11,904	12,447	13,489	[r] 12,466	• 16,100
Residual fuel oil……do	11,268	12,062	11,041	[r] 13,369	• 16,700
Lubricants……do	157	177	176	[r] 274	• 250
Other……do	2,880	3,186	5,252	[r] 5,717	• 3,300
Natural gas……million cubic feet	5,201	• 4,000	• 8,000	• 10,000	• 12,000

• Estimate.
[r] Revised.
NA Not available.
[1] Includes production of Goa.
[2] Includes ferruginous manganese ore.

TRADE

Exports of metals and minerals for the financial year ending March 31, 1964, were valued at $159.7 million, 10 percent of all exports. Of this total, minerals were valued at $126.3 million; metals and scrap, at $21.9 million; and petroleum products, at $11.5 million. Principal mineral exports were iron ore, mica, and manganese ore, valued at $76.4 million, $19.8 million, and $17.3 million, respectively.

Imports of metals and minerals during the 1963–64 financial year were valued at about $556 million, equivalent to 23 percent of all imports. Crude oil and petroleum refinery products were the leading imports and were valued at $219 million. Iron and steel imports were valued at $188 million; nonferrous metals, at $117 million; and ores and unprocessed minerals, at $32 million. India continued to depend on imports to supply most of its requirements for all nonferrous metals except aluminum.

In terms of value, the major nonferrous metals imported were copper, $56 million; zinc, $21 million; aluminum, $13 million; tin, $13 million; and lead, $7 million. Sulfur continued to be the major nonmetallic mineral imported, having a value of approximately $9 million.

TABLE 2.—India: Exports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962–63	1963–64	Principal destinations, 1963–64
Metals:			
Aluminum:			
Bauxite and alumina	151, 376	139, 260	Japan 87,083; Italy 30,233; West Germany 17,455; West Pakistan 2,485.
Metal, including alloys:			
Ingot	----------	7, 320	Belgium 4,723; Taiwan 1,511.
Semimanufactures	15	77	Malaysia 24; Ceylon 20; Aden 15.
Chromite, 47 percent Cr_2O_3	17, 517	11, 653	Japan 8,507; Sweden 3,047.
Copper and alloys:			
Unwrought, scrap, and equivalent forms	35	218	United States 175; West Germany 25.
Semimanufactures	278	681	Hong Kong 277; Ceylon 126; Iran 86; South Viet-Nam 61; Japan 55.
Ilmenite	88, 016	43, 841	United States 21,600; Japan 21,397.
Iron and steel:			
Ore and concentrates thousand tons	9, 127	9, 868	Japan 6,495; Czechoslovakia 1,015; West Germany 715; Rumania 468; Italy 399; Yugoslavia 263; Belgium 164; Poland 131.
Iron and steel scrap	179, 154	383, 927	Japan 383,372.
Pig iron	19, 316	----------	
Ferromanganese	12, 287	21, 927	United States 20,614; United Kingdom 814; South Korea 418.
Semimanufactures	13, 846	33, 029	South Viet-Nam 11,336; Iraq 3,312; Ceylon 3,212; Cambodia 2,052; Iran 1,933; Pakistan 1,492.
Manganese ore and concentrates	838, 376	954, 398	Japan 401,326; West Germany 124,640; United States 97,520; Czechoslovakia 69,562; United Kingdom 55,660; Belgium 36,640.
Zinc:			
Ore and concentrates	11, 840	9, 922	All to Japan.
Metal	377	1, 794	Belgium 725; Japan 709; Singapore 174.
Nonferrous metal scrap	167	420	Belgium 226; Japan 161.
Other nonferrous base metal ores and concentrates	2, 785	2, 532	Japan 1,702; Yugoslavia 335; Czechoslovakia 260.

See footnote at end of table.

TABLE 2.—India: Exports of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1962–63	1963–64	Principal destinations, 1963–64
Nonmetals:			
Barite	5,394	8,807	Japan 6,501; Taiwan 1,000; South Viet-Nam 406; Tanganyika 260; Australia 246.
Cement	35,267	68,973	East Pakistan 45,956; Ceylon 18,417; Mozambique 3,878.
Chalk	115	37	Ceylon 20; Singapore 8.
Clays, including bentonite	874	601	East Pakistan 419; West Pakistan 88; Burma 27.
Feldspar	721	2,109	United Kingdom 909; Japan 468; France 400; West Germany 300.
Gravel and crushed stone	66,833	12,958	East Pakistan 12,958.
Kyanite	39,976	25,844	Italy 6,488; United Kingdom 3,556; Netherlands 2,397; Denmark 2,166; West Germany 1,951; France 1,883; Belgium 1,423; United States 1,236; Japan 1,219.
Limestone	100,113	109,576	East Pakistan 109,442.
Magnesite	31,772	35,382	Netherlands 12,238; United Kingdom 8,91 United States 6,431; West Germany 3,653.
Mica:			
Block	1,939	1,758	Japan 574; United Kingdom 392; United States 264; West Germany 80.
Splittings	8,420	7,902	United States 3,273; United Kingdom 1,095; West Germany 582; Japan 558.
Condenser films	79	208	Poland 100; Japan 59.
Scrap	23,821	20,037	United Kingdom 5,791; Norway 3,481; United States 3,085; West Germany 1,691; Japan 1,438; France 1,204.
Total	34,259	29,905	
Salt	170,526	194,686	Japan 144,563; Ceylon 40,674.
Sillimanite	5,323	6,144	West Germany 2,800; Italy 895.
Steatite (block and powder)	15,115	13,380	Italy 2,713; United Kingdom 2,618; Norway 1,217; Ceylon 1,140; West Pakistan 923; Japan 526.
Stone (including marble)	2,046	7,515	East Pakistan 5,251; United Kingdom 2,121.
Miscellaneous nonmetallic and building raw materials.	11,789	13,727	East Pakistan 5,743; United Arab Republic 4,713; Japan 1,366.
Mineral fuels:			
Coal ... thousand tons	1,046	864	East Pakistan 808; Japan 16.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	2,124	3,245	New Zealand 1,187; Singapore 1,149; Malaysia 460; Australia 297.
Paraffin ... do	95	75	Peru 49; Thailand 13.
Other ... do	49	63	Kuwait 56.
Total	2,268	3,383	

---

[1] For financial year ending March 31.

TABLE 3.—India: Imports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962–63	1963–64	Principal sources, 1963–64
Metals:			
Aluminum:			
Bauxite	3,634	23	All from United States.
Alumina	19,988	3,543	United States 3,415; United Kingdom 71.
Metal, including alloys:			
Ingot	16,773	4,381	United States 2,666; Canada 1,028; United Kingdom 164.
Semimanufactures	23,679	20,739	United States 7,204; Canada 6,512; Yugoslavia 2,199; United Kingdom 1,657; U.S.S.R. 1,518; Belguim 663; West Germany 489.
Antimony ore	1,339	2,092	Bolivia 1,883; Peru 82.
Arsenic:			
Oxides	214	18	Belgium 11; West Germany 4.
Metal	177	226	U.S.S.R. 149; Sweden 75.
Chromite	1,524	----------	
Copper and alloys:			
Scrap, ashes, and dross	1,380	1,208	United States 606; Canada 228; Singapore 136; Mozambique 93.
Metal:			
Ingots and equivalent forms.	35,490	34,795	United States 28,673; Canada 2,652; Federation of Rhodesia 2,119.
Semimanufactures:			
Unalloyed	37,383	37,087	United States 23,222; Canada 7,451; Federation of Rhodesia 4,429; United Kingdom 926.
Alloyed	2,247	2,563	United Kingdom 811; West Germany 650; Yugoslavia 312; Japan 253; United States 199.
Iron and steel:			
Ore concentrates	374	102	United Kingdom 97.
Iron and steel scrap	1,737	1,232	United Kingdom 703; United States 483.
Pig iron	839	210	Sweden 194.
Ferroalloys	3,199	2,002	Japan 637; United Kingdom 312; Norway 297; West Germany 217; Netherlands 185.
Steel ingots and equivalent forms.	77,863	53,401	United States 13,805; U.S.S.R. 13,744; United Kingdom 11,912; Sweden 5,572; West Germany 2,368; Bulgaria 1,593.
Semimanufactures	854,296	927,932	United States 265,763; Japan 188,551; United Kingdom 127,773; Canada 70,506; West Germany 49,679; U.S.S.R. 37,081.
Lead, all forms	33,652	36,676	Burma 14,002; Australia 10,222; Canada 5,169; U.S.S.R. 4,988.
Magnesium, all forms	150	281	United States 187; Norway 67.
Manganese ore	14,662	10,575	Ghana 10,566.
Mercury 76-pound flasks	6,285	5,244	Spain 2,556; Italy 2,415.
Nickel and alloys:			
Unwrought and scrap	1,763	1,883	United Kingdom 1,252; Canada 454; United States 73.
Semimanufactures	205	271	United Kingdom 76; Canada 40; West Germany 36.
Platinum troy ounces	2,804	8,516	U.S.S.R. 4,282; France 2,765; West Germany 862.
Silver do	80,310	45,911	Belgium 23,525; Netherlands 9,842; United Kingdom 7,023.
Tin and alloys:			
Unwrought	4,277	5,054	Malaysia 2,835; Singapore 1,208; United States 989.
Semimanufactures	20	175	Malaysia 162.
Zinc and alloys:			
Unwrought	86,966	84,114	United States 28,502; Canada 20,149; Australia 14,126; U.S.S.R. 10,953.
Semimanufactures	1,314	1,158	Belgium 393; United States 287; Japan 204; United Kingdom 115.
Miscellaneous nonferrous metals and alloys.	99	118	Canada 29; United Kingdom 26; Belgium 13; Australia 12.

See footnote at end of table.

TABLE 3.—India: Imports of metals and minerals [1]—Continued

[Metric tons unless otherwise specified]

Commodity	1962–63	1963–64	Principal sources, 1963-64
Nonmetals:			
Abrasives, all forms	2,802	3,645	United States 2,033; United Kingdom 664; West Germany 291.
Asbestos, crude	22,860	39,820	Canada 20,151; U.S.S.R. 9,871; Southern Rhodesia 7,483; Mozambique 1,864.
Barium compounds:			
Carbonate	1,081	1,274	United Kingdom 598; East Germany 502; West Germany 164.
Sulphate and other	84	165	West Germany 116; United Kingdom 31.
Borax	4,403	6,006	United States 5,330; United Kingdom 271.
Chalk	2,153	1,604	United Kingdom 1,484; Austria 92.
Clay, including bentonite	11,702	10,987	United Kingdom 5,706; Czechoslovakia 2,827; Japan 955.
Cryolite	2,678	2,428	Italy 1,178; Denmark 531; France 300.
Diamond, industrial, including bort. thousand dollars	395	326	United Kingdom 171; France 84; United States 61.
Diatomite, including Fullers earth.	1,434	1,481	United States 958; West Germany 317; United Kingdom 158.
Fertilizers:			
Nitrogenous:			
Crude	16,335	14,973	All from Chile.
Manufactured	796,505	717,783	United States 163,116; Japan 149,613; U.S.S.R. 109,605; Italy 85,612; West Germany 67,453.
Phosphatic:			
Crude	305,960	336,781	Tunisia 126,719; Jordan 84,132; United Arab Republic 71,864; Morocco 54,062.
Manufactured	16,779	27,965	United States 27,387; Netherlands 281; Belgium 262.
Potassic, manufactured	81,163	75,083	East Germany 34,229; West Germany 27,408; France 12,997.
Fluorspar	7,272	8,116	Mexico 4,774; Thailand 1,919; United Kingdom 913; United States 493.
Graphite	2,322	1,068	Ceylon 409; North Korea 155; South Korea 148; Norway 144; United Kingdom 96.
Gypsum	32,937	42,295	All from West Pakistan.
Sulfur:			
Crude	254,072	231,084	United States 214,726; Canada 16,104.
Refined	2,518	1,671	United States 1,284; West Germany 295.
Other nonmetallics and building materials.	1,724	1,753	United States 452; Israel 108; Italy 90.
Mineral fuels:			
Coal, all ranks	9,236	2,016	United States 1,452; Norway 560.
Coke, all types	3,076	411	All from United States.
Petroleum:			
Crude thousand 42-gallon barrels	32,892	52,601	Iran 31,289; Saudi Arabia 19,617; Indonesia 1,556; Qatar 139.
Refinery products:			
Gasoline thousand 42-gallon barrels	874	710	Iran 623; Saudi Arabia 61; Bahrain 21.
Kerosine do	12,507	10,142	Iran 4,413; U.S.S.R. 2,178; Saudi Arabia 1,405; Bahrain 1,305; Aden 412.
Distillate fuel oil do	3,428	4,245	U.S.S.R. 1,836; Iran 1,425; Bahrain 463; Saudi Arabia 215.
Residual fuel oil do	1,360	2,337	Iran 1,212; U.S.S.R. 588; Bahrain 378; Saudi Arabia 101.
Lubricants do	1,621	2,708	United States 1,893; United Kingdom 331; Yugoslavia 217.
Other do	130	120	United States 75; Iran 20; Netherlands 15.
Total do	19,920	20,262	

[1] For financial year ending Mar. 31.

COMMODITY REVIEW

METALS

India is well endowed with the principal mineral resources required for its growing iron and steel industry. Proved reserves of high-grade iron ore and manganese ore were among the largest in the world, and its exports of these minerals were significant in world trade. Chromite reserves were adequate for domestic requirements, but India relied on imports of tungsten and nickel for its only significant raw material deficiencies in the steel industry.

Indian deposits of ilmenite and monazite are of world importance. Except for aluminum, the country remained dependent on imports for major nonferrous metals such as copper, lead, and zinc. During 1964, intensive exploration and development was conducted in an effort to increase nonferrous metal production.

Aluminum and Bauxite.—Aluminum production continued to be the foremost nonferrous metal industry. Bauxite reserves throughout India are estimated at 260 million metric tons, with about one-third of the reserve having an alumina content greater than 50 percent. During 1964, bauxite production and consumption was nearly 5 percent greater than that of 1963. The States of Bihar and Gujarat accounted for about one-half and one-third of total output, respectively.

At yearend, India had an annual installed aluminum ingot capacity of 58,000 tons. New facilities nearing completion should increase annual capacity to 70,000 tons early in 1965. Aluminum production targets of the Government are 88,000 tons for the last year of the third 5-year plan (1965–66) and 235,000 tons by the end of the fourth 5-year plan (1970–71). Licensed capacity including expansion of existing plants and construction of new plants was 150,000 tons. Future expansion will be largely confined to Madhya Pradesh, Bihar, and Orissa States, where cheap electric power and bauxite are available. New plants are each to have a minimum capacity of 25,000 to 30,000 tons of metal per year.

The United States Export-Import Bank on July 30 announced approval of an $11 million loan to the Hindustan Aluminum Corp., Ltd., to expand its plant capacity at Renukoot in Uttar Pradesh from 20,000 to 48,000 tons annually. On November 17, India and Hungary signed an agreement for preparation of a project report for a proposed integrated aluminum project at Korba in Madhya Pradesh. The proposed project would have an annual capacity of 120,000 tons of alumina and 30,000 tons of metal. The Mettur smelter in Madras, under construction by Montecatini (Italy) and private Indian interests, was nearing completion at yearend. The company had already proposed to expand the plant capacity from the initial target of 10,000 to 20,000 tons annually.

Chromite.—Production of chromite has declined steadily in recent years owing to loss of export markets. Reserves, estimated by the Indian Bureau of Mines as 5 million metric tons having 30 to 40 percent Cr_2O_3 content, would be adequate for domestic requirements for many years. Current production, largely from Orissa, was used mostly for manufacture of refractory bricks for domestic consumption. About one-third of total output was exported, mainly to Japan.

Chromite deposits at Baula and Naushahi in the Keonjbar district of Orissa are the largest in India, having estimated reserves of 2 million tons. Smaller deposits are located in the Singhbhum district of Bihar, the Mysore and Hasan districts of Mysore, the Krishna district of Andhra Pradesh, the Salem district of Madras, and the Ratnagiri and Sawantwadi districts of Maharashtra.

Copper.—The Indian Copper Corp. was the only producer of primary copper. Ore was produced from three mines in the Singhbum copper belt in Bihar and refined at a smelter at Moubhandar. Construction of the company's 8,400 tons yer year capacity electrolytic copper refinery at Ghatsila, Bihar, was nearing completion at yearend. The plant was to process imported blister copper. Also, the company has obtained Government approval to replace its obsolete smelter at Ghatsila with a new flash-type smelter. The new facilities, capable of producing an estimated 12,950 tons of copper and 35,000 tons of sulfuric acid annually, are scheduled for completion in 1966.

The Geological Survey of India and the Indian Bureau of Mines continued intensified exploration surveys in an effort to improve the copper supply position. From work done so far, the agencies reported estimated reserves of 70 million metric tons of ore, containing 0.8 to 2.0 percent copper, in the Singhbum district in Bihar. Copper deposits occur in various parts of the country in well-defined belts, the most important ones being in Rajasthan, Bihar, and Andhra Pradesh States; deposits also were found in the Alwar district of Rajasthan, the Dikchu district of Sikkim, and the Chandu district of Maharashtra.

The public sector project for development of the Khetri deposits in Rajasthan progressed. It was reported that an agreement had been reached for French technical and financial assistance to the National Mineral Development Corp. (an Indian Government agency) to bring Khetri into production. It has been planned to produce 21,000 metric tons of copper annually.

Gold.—All gold production was from Government-operated mines of Kolar Gold Fields and Hutti Gold mines in Mysore State. Efforts to improve the efficiency of these high-cost operations were continued. Kolar Gold Fields operated three mines and was engaged in a $3.15 million project to modernize operations. New gold-bearing reefs were reportedly discovered at the Hutti mine. A $2.5 million crushing and grinding plant, capable of handling 1,000 tons of ore daily and scheduled for completion in September 1966, was being constructed to replace the existing plant and to increase Hutti mine production from 350 to 1,000 tons daily.

The Indian Government reported that gold control measures introduced during 1963 resulted in a decline in the demand for gold and stabilized gold prices in India.

Iron Ore.—About one-fourth of the world's total known iron ore resources occur in India. Reserves of high-grade iron ore are estimated as 22,000 million tons, while those of low-grade ore are placed at about four times this quantity. Large high-grade reserves in Bihar and Orissa, located near principal Indian coalfields, supply most of the ore required by the domestic iron and steel industry. There are other major ore reserves in Madhya Pradesh, Mysore, Goa, Madras, and Maharashtra.

Iron ore was the major mineral export commodity and foreign exchange earner during 1964. Nearly one-half of ore produced was exported. Goa was the leading producing State with 27.6 percent of total output; it was followed by Orissa, Bihar, Madhya Pradesh, and Mysore, accounting for 26.9, 17.2, 14.0, and 11.8 percent, respectively. Andhra Pradesh, Maharashtra, and Rajasthan contributed the remaining 2.5 percent.

The Government of India continued major programs for iron ore resource development required for its growing iron and steel industry and for expansion of exports. Production targets for iron ore in the last year of the third plan (1965–66) were set at 29 million tons, including 16 million tons for export. Proposed targets to be achieved by the end of the fourth plan (1970–71) are 33 million tons for domestic consumption and 30 million tons for export.

The National Mineral Development Corp., wholly owned by the Government, continued developing the Kiriburu and Bailadila deposits of Orissa. The Kiriburu project, developed with financial and technical assistance from the United States and Japan, includes development of the ore deposit to supply 2 million metric tons annually of iron ore to Japan, construction of a railway from the mines to Visakhapatnam port, and expansion and mechanization of facilities at the port. On November 12, the project was commissioned officially. The railway was completed but delays in completing mechanical ore-handling facilities at the port were expected to defer full scale exports until mid-1965. The Bailadila project, developed with Japanese financial and technical assistance, to export 4 million tons of ore annually to Japan, was expected to be completed in 1966. Kiriburu and Bailadila exports via Visakhapatnam are expected to reach 6 million tons annually by 1966–67. It is planned that Kiriburu production will be diverted to the Bokaro steel mill, a projected public sector plant, when Bailadila production reaches 6 million tons annually.

The Orissa State Government continued development of iron mines in the Tomka-Daitari area, a 100-mile roadway, and mechanized port facilities at Paradip. The first phase of the project, expected to be completed by the end of 1965, will permit export of 2 million tons of ore annually to Japan.

Government plans to increase iron ore exports call for the simultaneous development of ore-handling facilities at five additional ports from Calcutta on the east coast to Marmagao on the west coast. Indian iron ore exports have been limited owing to lack of transport and port facilities. Indian ore is meeting increased competition from other areas because of its high transport costs. Also, Indian ores require beneficiation to upgrade quality to remain competitive in the Far Eastern market. The Government has given much study to the possibilities of iron ore pelletization. Feasibility studies covering pelletization of Kiriburu and Bailadila ores were completed. A fully automated $4.2 million plant for upgrading iron ore at Pale, in Goa, was commissioned on November 21. Esso Standard Eastern Oil Co., Inc., has offered to build an iron ore reduction plant in Goa capable of producing 1 million tons annually of a sinter or pellet containing 90 percent iron. The plant would utilize a direct reduction process, using petroleum as fuel and reducing agent.

Iron and Steel.—Forward progress in the iron and steel industry continued, both in fuller utilization of existing capacity and in implementing expansion plans to increase capacity. Total installed capacity of about 6.4 million tons of crude steel and 4.6 million tons of finished steel annually remained almost equally divided among public and private plants. The three public plants, operated by the Government-owned Hindustan Steel Co., Ltd. (HSL), are Bhilai in Madhya Pradesh, having 1.2 million tons capacity; Durgapur in Bihar, having 1.0 million tons capacity; and Rourkela in Orissa, having 1.0 million tons capacity.

The private plant capacity of 3 million tons was held two-thirds by Tata Iron and Steel Co. (TISCO) and one-third by Indian Iron and Steel Co. (IISCO). The Mysore Iron and Steel Works (MISW), a State of Mysore operation, had a capacity of 85,000 tons annually of mild steel.

Considerable progress was made during the year on programs to expand the capacity of public plants by nearly 3 million tons per year. As for the private plants, the Government approved in principle the plans by TISCO and IISCO to expand production of ingot steel by 1 million tons each.

The most important development in the iron and steel industry was an agreement between India and the U.S.S.R. for construction of the Bokaro public steel plant in Bihar. The U.S.S.R. agreed to extend credit up to $211 million for design, supply of equipment, and construction of this new plant, which was to have an initial ingot capacity of 1.5 to 2.0 million tons annually—a provision for subsequent expansion to 4 million tons was included. The project was scheduled for completion by 1970.

In 1964, production of pig iron was 0.2 percent less than that of 1963; however, output of ferroalloys, ingot steel, and finished steel was greater than that of 1963 by 8.0, 1.1, and 2.0 percent, respectively. Of the pig iron produced in 1964, 1,214,700 tons was available for sale to foundries. Raw materials consumed by the steel plants were iron ore, 10.9 million tons; coking coal, 9.3 million tons; noncoking coal, 979,000 tons; limestone, 3.05 million tons; dolomite, 674,000 tons; scrap, 890,500 tons; and manganese ore, 278,400 tons. Production of the various categories of finished steel by primary producers, secondary producers, and rerollers was nearly the same as that of the preceding year.

TABLE 4.—Production of finished steel by categories

(Metric tons)

Category	1963	1964
Structurals and special sections	879, 829	860, 200
Rails, railroad ties, wheels, tires, and axles	591, 788	621, 800
Sheets, plates, galvanized sheets, and tinplate	923, 217	933, 800
Bars and rods	1, 536, 510	1, 494, 600
Wire	60, 030	99, 100
Hoops and strips	93, 561	140, 200
Skelp	172, 585	193, 400
Total	4, 257, 520	4, 343, 100

SOURCE: Iron and Steel Control, Monthly Bulletins for January to December, 1963 and 1964. Ministry of Steel and Mines, Calcutta, India.

Despite the increased output of domestic finished steel, supply fell short of demand. In 1964, the total finished steel supply (neglecting stock changes) was 5,285,900 tons, including 942,700 tons of imports. Official estimates placed demand at about 5.6 million tons, but it was thought to be nearer 6.0 million tons. Salable pig iron and alloy and special steels were in particularly short supply. Available pig iron for sale to foundries was only about one-half the demand of 2.5 million tons.

Effective March 1, 1964, the Indian Government removed statutory distribution controls for many categories of steel products. It retained controls on about one-third of output, including pig iron and flat products. Also, it abandoned the retention price system and set up a Joint Plant Committee, comprised of steel plant managers and Government officials, to fix fair maximum prices for the decontrolled categories. Effective April 13, the Joint Plant Committee announced an upward revision in prices, ranging from $1.05 to $6.30 per ton, for decontrolled categories of steel. On March 1, the Iron and Steel Controller, raised the prices of controlled steel categories by an average of $6.30 per ton.

Lead-Zinc.—Indian remained dependent on imports for 90 percent of its lead and zinc requirements. The Metal Corp. of India, Ltd., was the only firm in the country producing lead and zinc. The company mined about 500 tons of ore daily from mines at Zawar near Udaipur in Rajasthan. Exploration and development at Zawar indicate proved and probable reserves of about 27.4 million tons of ore, having 1.81 percent lead and 3.56 percent zinc content.

Lead concentrate was smelted at Tundhoo in Bihar where pure lead metal and some silver was recovered. The company continued construction of additional lead-smelting facilities at Tundhoo to produce as much as 10,000 tons of metal annually.

Zinc concentrate was shipped to Japan for smelting on a toll basis, and the recovered metal was shipped back to India. The Metal Corp. of India Ltd., continued construction of an electrolytic zinc plant near the Zawar mines to produce 18,000 tons of zinc and 70 to 80 tons of cadmium yearly. This project has had serious financial and foreign exchange difficulties, and the corporation has approached the Government for assistance.

Cominco Binani Zinc Ltd., continued construction of a zinc smelter at Alwaye, Kerala, which was scheduled for completion in mid-1966. Imported zinc concentrate will be processed and 20,000 tons of zinc, 45,000 tons of sulfuric acid, and 30 to 40 tons of cadmium produced annually.

Imports of lead and zinc during the latter half of 1964 were curtailed because of limited foreign exchange, and consumers experienced acute shortages.

Manganese.—Reversing a downward trend of recent years, manganese ore production was nearly 11 percent more than that of 1963. Exports, mostly under barter deals, reached about 1.5 million tons, valued at $28.6 million. Compared to 1963, the quantity and value of manganese exports increased by 16 and 66 percent, respectively.

The Minerals and Metal Trading Corp. (MMTC), a Government agency, handled about one-half of total manganese ore exports and private firms exported the remainder. In June, the MMTC announced that barter sales of manganese ore would be discontinued effective January 1, 1965. The MMTC planned to arrange long-term contracts for export sales. Under regulations in force at yearend, private exporters were free to sell on cash terms, but they could no longer receive special import privileges available under barter deals.

Reserves of all grades of manganese ores are estimated at 180 million tons, the third largest in the world. Principal ore belts are in the Bhandara and Nagpur areas of Maharashtra and in the Balaghat, Chhindwara, and Indore areas of Madhya Pradesh. Significant deposits occur in various areas of Orissa, Bihar, Gujarat, Andhra Pradesh, Rajasthan, and Goa.

Although the majority of India's nearly 400 mines were small surface operations, most production came from a relatively few large mines.

Manganese (India), Ltd., owned 51 percent by the Indian Federal Government and the State Governments of Madhya Pradesh and Maharashtra and 49 percent by Central Provinces Manganese Ore Co., continued as the largest producer from its large central area mines. Other important manganese producers were Tata Iron and Steel Co.; R. B. Seth Sheeram Durgaprasad; Shivrajpur Syndicate; Jeypore Sugar Co., Ltd.; Agarwal, R. S. Seth Gopikishan; and Orissa Mineral Development Co., Ltd.

Domestic consumption of manganese ore was estimated to be 400,000 tons during 1964, including 278,400 tons used by the iron and steel industry.

Mineral Sands.—The deposits that extend from Quilon to Cape Comirin on the south and west coasts of India contain world-important resources of ilmenite, rutile, zircon, monazite, and other rare-earth minerals. The beach sands of Kerala and Madras contain reserves of ilmenite estimated at 350 million tons. An average analysis of the sands shows ilmenite, 65 to 70 percent; zircon, 5 to 10 percent; sillimanite, 5 to 10 percent; quartz, 5 to 10 percent; and monazite and magnetite, 1 to 2 percent.

Production of ilmenite has declined rapidly in recent years owing to decline of export demand. The presence of small quantities of chromite has adversely affected its marketability. Domestic demand has been limited to 14,000 tons annually, processed by Tranvancore Titanium Products, Ltd., to produce 18 tons per day of titanium dioxide for paints. The company began steps to expand the capacity of the plant to 25 tons per day, the first stage of a government-approved program to increase capacity to 50 tons per day.

Monazite in the beach sands was recovered, along with ilmenite, by simple gravity separation methods and was processed at the Indian Rare Earths, Ltd., plant at Alwaye, Kerala. This company, owned jointly by the Government of India and the State of Kerala, produced thorium hydroxide and other rare-earth compounds. The thorium hydroxide was treated further at the plant of the Atomic Energy Establishment near Bombay to produce thorium nitrate, thorium oxide, and uranium flouride.

Silver.—Most of the silver was recovered as a byproduct from lead-zinc concentrates at the Zawar mines of the Metal Corp. of India, Ltd.

This company accounted for 93 percent of the total output of 152,202 troy ounces in 1964. The remainder was recovered as a byproduct of gold refining. No silver was imported.

NONMETALS

Resources of nonmetallic minerals include outstanding reserves of mica and adequate reserves of high-quality refractory minerals, limestone, dolomite, and building raw materials. India has serious deficiencies of fertilizer raw materials, sulfur, asbestos, borax, fluorspar, and other industrial minerals.

Cement.—Cement remained in exceedingly short supply. Although the cement industry operated at 92 percent of its installed capacity of 10.5 million tons annually, estimated requirements exceeded domestic production by about 1 million tons.

The Indian cement industry consisted of 34 privately owned and 3 public plants. There were plants in all States of India except Assam, West Bengal, and Maharashtra. Total capital investment in the industry was about $241.5 million, and the ex-works value of production was an estimated $170 million. The industry provided direct employment to 55,000 workers. Although most producing plants are privately owned, the Government-owned State Trading Corp. handles distribution and fixes sales prices on a uniform free-on-rail-destination basis. The average destination price for bulk cement was $22.54 per ton.

The Government of India has issued licenses of 5.9 million tons of additional capacity and given advance approval for a further 3.5 million tons in efforts to meet cement shortages. On May 19, the Government established the Cement Corp. of India, a wholly Government-owned company, to promote more rapid development of the cement industry. According to official plans, this company intends to establish 25 public sector plants in the near future. Total national targets established to be achieved by the end of the fourth 5-year plan (1966–71) are 26 million tons capacity and 23 million tons of output.

Mica.—As in past years, India continued to supply nearly 80 percent of World requirement for dressed mica from numerous small mines located mainly in Bihar, Andhra Pradesh, and Rajasthan.

In an effort to correct some malpractices in the mica trade and to increase net foreign exchange earnings from mica, the Indian Government imposed a number of regulatory measures on the mica trade during 1964. Effective February 15, an embargo was placed on export of waste and scrap mica; floor prices were established for other qualities. Exports on a consignment basis were banned by requiring purchases be made under an irrevocable letter of credit at least to 90 percent of invoiced value. The embargo on waste and scrap mica was lifted in March, but a floor price of $14.70 per ton was set for these qualities. Effective August 1, new rules were introduced making preshipment inspection of mica compulsory.

Mica exports declined slightly but increased market prices brought the value to $20.5 million, 9 percent more than that of 1963.

An estimated 3,000 metric tons of mica was consumed by Indian industries, largely in manufacturing mica bricks, micanite, and powder.

Salt.—Most salt was produced by solar evaporation of sea water.

Small quantities were produced from salt lakes and wells in Rajasthan and from the Mandi rock salt mines of Himachel Pradesh. Gujarat was the principal producing State, accounting for nearly half of total output. Most of the remaining production was from Madras, Maharashtra, Rajasthan, and Andhra Pradesh.

Most salt output was for domestic human consumption, but exports of salt to Japan have increased in recent years. In May, the State Trading Corp. concluded an agreement to export 600,000 tons of salt to Japan over a period of 2 years, beginning July 1, 1964.

Sulfur and Pyrite.—India continued to depend on imports for all its sulfur requirements. In recent years, annual imports of elemental sulfur have been valued at about $10 million.

The Indian Bureau of Mines continued development of the Amjhor pyrite deposits in the Shahabad district of Bihar. To date, about 392 milion tons of pyrite ore, containing an average sulfur content of 40 percent, has been developed. The Central Fuel Research Institute reportedly has developed a new process for recovering elemental sulfur and sulfur dioxide from the Amjhor pyrites. A pilot plant of 1-ton-per-hour capacity for processing pyrite was expected to begin test operations at yearend.

MINERAL FUELS

Coal continued as India's most important mineral asset and the main source of commercial energy. Known resources of petroleum were limited, and despite increased petroleum development, India remained dependent on imports for most of its petroleum requirements.

Despite vigorous efforts by the Indian Government in recent years to utilize mineral fuels more fully to meet rising energy and fuel requirements, mineral fuels continued to supply less than half of the total energy consumption. Cattle dung, firewood, and agricultural waste remained as the principal domestic fuels consumed.

Coal.—Coal accounted for about 75 percent of the value of all mineral output in 1964. Reserves of coal in seams 4 feet or more in thickness to a depth of 2,000 feet have been estimated at more than 50,000 million tons but minable reserves of coking-grade coal are limited to about 2,800 million tons. Principal reserves are located in the coalfields of Madhya Pradesh, Bihar, West Bengal, and Orissa in northeastern India. There are other major deposits in Andhra Pradesh, Assam, and Maharashtra.

India ranked sixth among the coal-producing countries of the world. Production declined by 5 percent from that of 1963, but continued to exceed actual demand. Anticipated higher demand failed to materialize, largely as a result of (1) the failure of industrial activities to achieve planned growth levels, and (2) delays in the completion of coal-consuming projects. A surplus of low and medium grade coal developed which led to distress sales to clear mounting stocks. At yearend, coal stocks totaled about 5 million tons at pitheads and 3.5 million tons held by consumers.

Bihar was the leading producing State, having nearly half the total output; it was followed by West Bengal, Madhya Pradesh, Andhra Pradesh, Orissa, and Assam. About 825 mines were in operation and average daily employment reached a record total of 485,564 mine workers in June. Most of the mines were privately owned. Public mines in Bihar, Madhya Pradesh, Orissa, and Maharashtra were operated by the National Coal Development Corp. (NCDC), a wholly-owned Government company. The Government of Andhra Pradesh State held the majority interest in the Singareni Collieries Co., Ltd., which operated 3 mines in the State.

Expansion and development of the coal industry continued. The original production target for the last year of the third 5-year plan (1965–66) was 90 million tons but this has been revised downward to 85 million tons. Production of 125 million tons was the target proposed to be achieved by the end of the fourth plan (1970–71). The NCDC proposed to develop 14 deep-shaft mines by the end of the fourth plan to add 25 million tons of annual capacity to Government-owned mines. Nine mines in the Jhari coalfields were to be developed with Polish assistance. Development of two of these mines began in 1964. The British will assist in the development of three mines in the Bokaro area in Bihar. Two mines will be developed at Dissergarh in West Bengal. Other NCDC projects received assistance from France, U.S.S.R., and the United States. On February 28, the Indian Coal Board signed an agreement with a United States firm for construction of two aerial ropeways for moving sand for stowing operations in the Jharia coalfields of Bihar. A United States Agency for International Development (USAID) loan of $7.7 million will finance the foreign exchange cost of this $12.6 million project. It was estimated that an additional 1.5 million tons per year of coking coal could be taken from these mines by use of this method—sand is used to fill worked out areas of the mines—permitting greater recovery of pillars of coal formerly left in place as supports.

Programs to modify existing coal washeries and construct new washeries were continued in an effort to increase the supply of good quality domestic coking coal to the steel plants. Washing capacity to be achieved by the end of the fourth plan (1970–71) was set at 44 million tons input and 22 million tons output of washed coal. The Patherdih washery in Bihar was completed at midyear, bringing existing capacity to 1 million tons of raw coal. A USAID loan of $5,100,000 will be used to double the annual capacity of the Dugda washery to 4,800,000 tons.

Government regulation of the coal industry continued; however, all controls of consumption and movement of coal were removed in an effort to reduce excess stocks. A subsidy granted to cement and power plants which substituted furnace oil for coal was withdrawn on March 28. The Government authorized three increases in pithead prices of coal during the year.

Lignite.—The Neyveli Lignite Corp. increased production from its opencast mine in Madras 58 percent from that of 1963. The additional production was utilized in the Neyveli thermal powerplant. On April 29, the first phase of the Soviet-aided power project was completed with the commissioning of the fifth 50,000 kilowatt generator.

Petroleum.—India continued and intensified its efforts to develop indigenous petroleum resources and to increase refinery capacity.

Crude oil production and output of refined products was more than that of 1963 by 35 percent and 12 percent, respectively.

India's only proved petroleum and natural gas reserves are located in Assam and Gujarat. Oil exploration and production operations have been conducted by Oil India, Ltd. (owned jointly by the Government of India and Burmah Oil Co.), on concession areas in Assam and in the Northeast Frontier Agency. Also, the Assam Oil Co., a fully-owned affiliate of Burmah Oil Co., continued to operate the almost depleted Digboi field of Assam.

Oil India continued development drilling in the Nahorkatiya, Hugrijan and Moran fields of upper Assam, which had a total reported reserve of 300 to 350 million barrels of oil and about 750 billion cubic feet of gas. In January, the company was granted a license to explore for oil in a 580-square-mile area in Ningru in the Northeast Frontier Agency. The company operated four rigs during 1964, largely on development drilling, but it continued exploration of the 1,291-square-mile concession area near the existing oilfield that was obtained in 1963.

The Oil and Natural Gas Commission (ONGC), a Government entity, actively continued development of the Ankleshwar and Kalol oilfields and the Cambay gasfield of Gujarat, and expanded exploration efforts in Gujarat, Assam, West Bengal, Punjab, Uttar Pradesh, Rajasthan, and the Coromandel coast off Madras. By the end of December, 1964, ONGC had completed a total of 280 wells throughout India as follows: Gujarat, 258; Assam, 14; Punjab, 5; Ganga Valley, 2; and Madras, 1. The ONGC operated the producing fields of Gujarat, where estimated reserves were reported to be 80 million barrels of oil and 400 billion cubic feet of gas. ONGC continued to receive considerable assistance from the U.S.S.R. and to a lesser extent from Italy, Rumania, France, and Yugoslavia in its oil operations. During 1964, the stepped up oil exploration activities failed to develop major oil discoveries. Small oilfields were discovered at Navaaon near Ankleshwar in Gujarat and at Lakwa near Digboi in Assam. Oil shows were found in the Cauvery basin on the Madras coast.

In an effort to develop crude oil supplies, the Indian Government sought oil concessions outside India. On December 22, it was announced that the National Iranian Oil Co. had approved the grant of an oil exploration and production concession to a group including the ONGC, Phillips Petroleum Co. of the United States, and Ente Nazionale Idrocarburi of Italy. Under terms of the agreement the group was to undertake to develop oil production in offshore Iranian concession areas in the Persian Gulf. Oil production would be shared equally between the group and the Iranian Government.

At yearend, operating refineries had a capacity to process 219,000 barrels per day of crude oil. Private refineries had 164,000 barrels per day of the total capacity and produced most of the refined products.

Expansion of public sector refineries continued to receive attention. The Gauhati refinery in Assam, built with Rumanian assistance, operated throughout the year processing domestic crude oil. On August 19, the Indian Government announced that Rumania had offered to assist in expanding the refinery capacity from 15,000 to 25,000 barrels per day.

The first 20,000-barrel-per-day unit of the Barauni refinery in Bihar, financed and built by the U.S.S.R., was placed in partial operation in July. The second 20,000-barrel-per-day unit was nearing completion at yearend and a third was under consideration. Construction of the 40,000 barrel-per-day Koyali refinery in Gujarat continued with Soviet assistance. On December 11, an agreement was signed by India and the U.S.S.R. to expand Koyali capacity to 60,000 barrels per day by addition of a third distillation unit. The first two units were scheduled for completion in 1965. Construction of the 50,000-barrel-per-day Cochin refinery in Kerala was started in August. This refinery was being built by Cochin Refineries, Ltd., owned 51 percent by the Government of India, 25 percent by Phillips Petroleum Co., and 24 percent by private Indian investors. Phillips arranged loans of $18 million to cover the foreign exchange cost of construction. The refinery was scheduled for completion by January 1966.

Minority equity participation by private firms as provided in the Cochin refinery agreement appears to have become the accepted means of new refinery construction in India. On November 4, the Government of India announced acceptance of a proposal by the National Iranian Oil Co. and the American International Oil Co. (a subsidiary of Standard Oil Co. of Indiana) for construction of a 50,000-barrel-per-day refinery at Madras. Also, the Indian Government invited private participation proposals for construction of a 50,000-barrel-per-day refinery to be located at Haldia, near Calcutta.

On August 31, the Indian Government announced the formation of the public sector Indian Oil Corp. to combine refining and marketing functions previously conducted separately by Indian Refineries, Ltd., and Indian Oil Co. Also, Indian Engineers, Ltd. (owned 51 percent by the Government and 49 percent by the Bechtel Corp. of the United States), was established to represent the Government in the design, construction, and supervision of public sector refineries.

Considerable progress was made during 1964 in construction of pipelines. Those under construction were being built by the Italian Government-owned oil entity, Ente Nazionale Idrocarburi (ENI), and financed by an ENI credit of $96 million granted to India in 1961. The credit, of which $45 million has been used for petroleum exploration and pipeline construction, was scheduled to end in June 1965, but in August 1964 it was reported that ENI had agreed to extend the date for utilization of the credit. India's first products pipeline, a 270-mile, 8-inch-diameter line from Gauhati refinery to Siliquri in West Bengal, was commissioned on December 20. Construction was continued on the 12-inch, 640-mile, Haldia-Baruni-Kanpur products pipeline. In Gujarat, a network of five crude pipelines, totaling 220 miles, was under construction.

Total consumption of petroleum products during 1964 was estimated to be 79 million barrels, nearly 18 percent more than that of 1963. Product imports continued to account for about 27 percent of total consumption.

The Mineral Industry of Pakistan

By E. Shekarchi[1]

◆

CONTINUED exploitation of Pakistan's resources of natural gas, coal, chromite, gypsum, marble, and limestone, contributed about $21 million[2] to the country's gross national product (GNP) in 1964. Although extensive geological investigations and explorations have been in progress with the assistance of the Agency for International Development, the United Nations Special Fund, and Russian technicians employed under the terms of the 1961 Soviet credit to Pakistan, no new workable mineral deposits of significance were found during 1964.

Crude mineral production in Pakistan in 1964 apparently accounted for about 0.3 percent of the estimated GNP of about $9,450 million (in current prices). By adding the value of cement output and steel rerolling mill production to crude mineral output values, the total contribution of the mineral industry to the GNP was still less than 1 percent. According to the Pakistan National Income Commission, per capita income rose from $80 in fiscal year 1963 to $82 in fiscal year 1964, an annual growth of approximately 2 percent.

Pakistan's total labor force includes approximately 32 percent of the nation's total population, or 29 million persons (including 12 million in West Pakistan and 17 million in East Pakistan). Only about 10 percent of this labor force was engaged in industrial activity of any kind, including mining and mineral processing, compared to about 75 percent engaged in agriculture.

GOVERNMENT POLICIES AND PROGRAMS

As a part of its efforts to stimulate industrial activity, the Government of Pakistan announced completion of several significant agreements with foreign interests in 1964 to increase energy availability. These included receipt of a $15 million World Bank loan for extension of natural gas lines from the Sui field into northern West Pakistan as well as the signing of an agreement between the East Pakistan Industrial Development Corp. (EPIDC) and Pakistan Shell Oil Co. for construction of a 1,500-kilometer pipeline to supply gas from the Titus field to Dacca.

Expanded use of natural gas in West Pakistan was more certain as a result of the agreement reached between the Government of Pakistan and Esso Standard Eastern Inc. to construct a $26 million ammonia-urea plant near the Mari gasfield.

---

[1] Foreign minerals specialist, Division of International Activities.

[2] Where necessary, values have been converted from Pakistan rupees (PRs) at the rate of PRs4.76=US$1.

The U.S. Agency for International Development announced on May 22, 1964, its approval of a $3.8 million loan to finance installation of a third 40-megawatt hydroelectric generator at the Kaptai Dam on the Karanphuli River in East Pakistan. The new unit was expected to be in operation by 1967.

In June 1964, completion of five diversion and power tunnels at the Mangla Dam project on the Jhelum River was announced, well ahead of schedule. It was hoped that river diversion operations would be completed by September 1965 and that the million kilowatt powerplant would be ready for operation by 1967.

Other government efforts to stimulate industrial activity included improvement of port facilities. On May 14, 1964, the World Bank made a 25-year, $17 million loan to the Trustes of the Port of Karachi for the expansion and improvement of the facilities. Karachi, the only deep-water port in West Pakistan, not only handled all the foreign trade to West Pakistan but also the traffic between West and East Pakistan. The project was scheduled for completion by the end of 1967 at a total estimated cost of $37.5 million.

A government communique indicated that the Ministry of Communications has accepted the recommendations made by F. R. Harris, Consulting Engineers, for the establishment of a permanent port on the Pussur River near Mongla in East Pakistan. The first phase of construction began in 1964. The project, which will extend over a period of 5 years, reportedly will cost about $42 million. When completed, the port will include a continuous marginal wharf structure along the Pussur River bank.

Pakistani Government interest in establishing a significant steel industry remained strong, as shown in the nation's second 5-year plan which called for expenditures of up to $35.5 million of government funds for the public sector's share of an overall $68 million proposed expenditure for steel industry development.

PRODUCTION

Petroleum production from the Potwar plateau oilfields, the only producing area, was 6.1 percent greater in 1964. Total production of natural gas from Pakistan's major gasfields at Sui in West Pakistan, and Sylhet and Chhatak in East Pakistan, reached a new high, about 18 percent above the 1963 level. Ninety percent of the total gas production was from Sui and was used primarily by the industrial consumers in Sukkur, Hyderabad, Karachi, and Multan. East Pakistan production was utilized almost entirely by the Fenchuganj Fertilizer Factory (Sylhet) and Assam Bengal Cement Works (Chhatak). Further production increase is foreseen with the completion of a new petroleum refinery under construction.

Total production of fertilizers was still much short of requirements with an estimated increase of only 17 percent over that of 1963. It was proposed in the third 5-year plan to increase the capacity of the present plants both through expansion of existing units and through installation of new ones. Available information on 1963 production indicated an increase of 100 percent in urea production, whereas the production of ammonium sulfate, ammonium nitrate, and superphosphate was at the 1962 level.

Because of the upward trend in general construction within the country, production of cement apparently increased slightly in 1964. As a result of the drilling programs in the natural gasfields, production of barite increased 148 percent compared with that in 1963.

TABLE 1.—Pakistan: Production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Antimony:					
Concentrate	90	20	107	[r] 15	160
Metal content of concentrate [e]	63	14	75	75	82
Bauxite	583	412	----------	NA	NA
Chromite	18,384	25,506	[r] 21,474	[r] 14,536	13,511
Iron and steel:					
Iron ore [2]	5,508	3,865	----------	[2] 68	4,824
Crude steel	11,503	11,842	[3] 10,706	[3] 11,590	12,169
Lead ore	17	63	114	73	22
Manganese ore	297	350	[r] 925	1,409	996
Nonmetals:					
Barite	643	444	2,870	[r] 4,841	[p] 12,007
Bentonite	1,355	982	[r] 290	[r] 432	290
Celestite	1,353	419	[r] 379	[r] 380	235
Cement [4] thousand tons	[r] 1,138	1,243	1,395	1,498	[e] 1,500
China clay	74	717	20	NA	970
Dolomite	16	352	482	[r] 648	720
Fertilizer [5]	NA	NA	158,280	254,481	[e] 300,000
Fire clay	16,329	16,323	10,005	35,900	16,790
Fullers earth	1,505	9,698	8,708	12,800	7,000
Gypsum	90,978	101,197	[r] 179,000	[r] 195,000	196,000
Limestone thousand tons	1,081	1,195	1,156	[r] 1,418	1,900
Magnesite	441	163	[r] 940	[e] 1,000	617
Marble	5,329	5,000	2,259	7,289	9,736
Mica kilograms	----------	----------	----------	726	4,318
Salt:					
Rock thousand tons	184	201	[r] 192	[r] 239	197
Other do	252	188	257	212	325
Silica sand	26,288	13,359	17,287	23,870	25,965
Sulfur	NA	NA	NA	NA	1,500
Talc (reported as soapstone)	3,424	1,235	1,120	1,870	2,500
Mineral fuels:					
Coal thousand tons	831	921	[r] 979	[r] 1,223	1,195
Natural gas [6] million cubic feet	29,842	34,665	42,076	49,459	59,100
Petroleum:					
Crude thousand 42-gallon barrels	[r] 2,638	[r] 2,832	[r] 3,341	[r] 3,517	3,732
Refinery products:					
Gasoline do	731	776	1,089	[r] 2,219	[e] 2,700
Kerosine do	140	189	507	[r] 1,546	[e] 2,239
Distillate fuel oil do	512	685	1,137	NA	[e] 3,800
Residual fuel oil do	693	762	1,695	NA	[e] 4,000
Lubricants do	56	73	63	NA	97
Other do	181	157	494	NA	183
Total do	2,313	2,642	4,985	NA	13,019

[e] Estimate. [p] Preliminary. [r] Revised. NA Data not available.

[1] Except where otherwise noted, output is all from West Pakistan.

[2] Officially reported as iron ore but consists of test lots obtained during exploration which were not used to recover iron.

[3] Includes East Pakistan as follows: Ingot steel: 1962—139; 1963—2,118.

[4] Includes East Pakistan as follows: 1959—44; 1960—70; 1961—96; 1962—90; 1963-77.

[5] Includes: Urea 131,151; superphosphate 6,651; ammonium sulfate 49,724; and ammonium nitrate 66,955 in 1963.

[6] Includes East Pakistan.

TRADE

Because of the highly competitive world market, export of chromite, one of the principal mineral exports of Pakistan, was slightly less in 1963 than in 1962.

Quantitative data on cement imports for both provinces of Pakistan showed a 600 percent increase in 1963 over the 1962 figures; yet, the shortage of cement remained at a critical level. The value of imported fertilizer of all types increased 57 percent whereas import of coal and coke showed only a slight gain. The available figures on the value of petroleum imports showed a substantial decrease, 13 percent, for 1963 as compared with 1962. The main decrease was in petroleum products and not in crude petroleum. In 1964 the refineries within the country produced 62 percent of apparent domestic consumption and the trend toward greater domestic refining continued. Imports of iron and steel excluding semimanufacturers showed a 10-percent decrease in 1963. The decrease was perhaps due to oversupply in 1962, for imports of iron and steel in 1963 were at the same level as in 1961.

TABLE 2.—Pakistan: Imports of selected metals and minerals[1]

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963
Metals:			
Aluminum and alloys:			
Unwrought	5,947	NA	--------
Semimanufactures	5,533	NA	7,582
Arsenic and oxides	45	33	24
Copper and alloys:			
Unwrought	2,146	2,512	2,513
Scrap	266	148	126
Semimanufactures	3,362	NA	5,226
Iron and steel:			
Scrap	526	50	886
Pig iron	43,609	77,569	51,525
Ferroalloys	1,163	943	582
Ingots and primary forms	231,878	233,393	229,893
Lead and alloys:			
Ore	445	237	259
Unwrought	1,471	NA	1,144
Semimanufactures	[r] 252	NA	15
Mercury ... 76-pound flasks	416	294	925
Tin and alloys ... long tons	489	461	380
Zinc and alloys	3,631	224	2,325
Nonmetals:			
Asbestos cement sheets	403	1,683	527
Barite	398	83	9
Borax	410	292	345
Cement ... thousand tons	218	135	[2] 937
China clay	5,721	9,211	1,439
Graphite	305	397	448
Nitrates	106,221	109,580	153,718
Potash salts	705	609	147
Salt	5,868	9,053	1,946
Sulfur	5,724	9,053	4,842
Mineral fuels:			
Coal ... thousand tons	1,260	1,333	1,251
Petroleum:[2]			
Crude ... thousand 42-gallon barrels	--------	2,461	13,100
Refinery products:			
Gasoline ... do	1,504	1,273	576
Kerosine ... do	3,253	3,300	2,708
Distilled fuel oil ... do	4,287	4,169	2,720
Residual fuel oil ... do	6,345	6,009	2,074
Lubricants ... do	254	--------	2
Other ... do	246	174	114
Total ... do	15,889	14,925	8,194

[r] Revised. NA Not available.

[1] Except where otherwise noted, data are derived from Statistical Summary of the Mineral Industry World Production, Exports and Imports 1957–62. Overseas Geological Surveys, Mineral Resources Division, London, 1964, p. 416.

[2] Based on data from various dispatches from the U.S. Embassy, Karachi, Pakistan.

TABLE 3.—Pakistan: The value of imports and exports of selected metals and minerals

(Value in thousand dollars)

Commodity[1]	Imports		Exports	
	1962	1963	1962	1963
Metals:				
Iron and steel	87,786	117,880	116	
Others	18,884	19,218	509	
Nonmetals:				
Cements and building products	4,827	7,348	481	
Fertilizers	15,807	24,985		903
Salt			273	244
Stone, sand and gravel	684		594	630
Sulfur	185	174		
Others	2,050	2,099	304	292
Mineral fuels:				
Coal and coke	10,244	11,111		
Petroleum:				
Crude		13,425		
Products	52,428	39,208		
Total value	192,895	235,448	2,277	2,069

[1] Except where otherwise noted, data are derived from United Nations Commodity Trade Statistics, 1962 and 1963.

COMMODITY REVIEW

METALS

Chromite.—Production of chromite remained at approximately the same level as in 1963. Under a barter deal with Poland, the private chromite producers of Pakistan reportedly were able to market low-grade ore (45 percent Cr_2O_3) in an oversupplied chromite world market. If such a market could be established, then it would be possible to increase production of both low- and high-grade ore during 1965. Export of chromite in 1963 was reported to be about 3,955 metric tons.

Iron Ore.—According to a Pakistani Geological Survey report, the iron ores of Pakistan include sedimentary and igneous-metamorphic types. Known iron ore resources in Pakistan were estimated to exceed 400 million tons. The type and location of some of these deposits are presented in table 4.

Although the iron resources appear to be large, none of the deposits is known to be an economic source of iron under the present conditions. Economic problems such as poor quality, difficult metallurgy, transportation, small size, and inaccessibility of deposits might be overcome in the future and make these deposits more attractive.

Iron and Steel.—The total appropriation for steel production made in the second 5-year plan by the Government of Pakistan was about $68 million, of which the public sector was expected to provide up to $35.5 million. The pilot plant at Kalabagh was to be entirely in the public sector. The industrial investment schedule provided for a total of $33.6 million from the private sector, of which approximately $21 million were earmarked for West Pakistan and the remainder for East Pakistan.

The feasibility studies for a steel plant in Karachi with 350,000-ton steel ingot capacity, which were accepted by the Pakistan Government,

TABLE 4.—Pakistan: Iron reserves

Division	Location	Type	Estimated reserve (thousand tons)	Estimated grade	Approximate iron content (thousand tons)
West Pakistan:					
Sargodha	Kalabagh	Sedimentary	309,326	30–34	99,000
	Makarwal Sakesar	do	2,556	32	820
	Chappar (Salt Range)	Lateritic	125	13–25	24
Peshawar	Hazara District Goldanian	Sedimentary	60,000	15–20	11,500
	Abbottabad	do	2,500	20–25	560
	Langrial	do	20,000	30–45	7,500
	Tarbela (Hazara)	Hydrothermal	65	20	13
Chitral	Parabek, Lutikho Valley	Sedimentary	30	60	18
	Dammer Nisar	Contact metamorphic.	3,700	40–65	1,940
Quetta	Bandegan, Chagai District	do	14	35–54	6
	Baluchap Kundi	do	8	43–64	4
	Ziarat	Lateritic	15,000	20	4,350
Rawalpindi	Surg (Camp-Bellpur)	do	250	12–17	36
East Pakistan	Cox's Bazar	Placer	25	65	16
Total			413,599		125,787

Source: Iron Ore Resources of Pakistan. Industry and Natural Resources, Monograph Series No. 3, 1964, pp. 6–7.

were forwarded to the Export-Import Bank in January 1964. After examining the report, the Export-Import Bank, which was asked to loan about $60 million for the construction of the plant, decided to send a five-man team of U.S. steel experts to investigate the engineering feasibility of the project with reference to power requirements, channel dredging, gas supply, and dock and railway facilities. The team arrived in Pakistan in September 1964 but no information was available on its findings at yearend.

The construction of the Chittagong Steel Mill by the Kobe Steel Works Ltd. of Japan progressed in 1964. The Chittagong plant, which will have a 150,000-ton capacity, reportedly will operate on imported pig iron scrap. The plant will cost $60 million, including $38 million in foreign exchange. The foreign exchange component of the cost reportedly was met from a Japanese loan agreement. The steel mill was scheduled to go into production in 1965.

NONMETALS

Barite.—To improve the barite industry, a combined loan (local and foreign exchange) of about $300,000 was sanctioned for establishment of a barite crushing and grinding industry in Quetta. The foreign exchange loan will be provided out of West German credit. The plant will go into operation by mid–1965 and will have an annual capacity of 2,400 tons. The raw material for the plant will be supplied from Khuzdar barite deposits that have an estimated reserve of more than 1 million tons.

Celestite.—Although production of celestite has declined markedly from the level of 1,353 tons in 1960, the exploitation of celestite remained an interesting venture in Pakistan's mineral industry. Preliminary reports indicated the presence of celestite at Thana Bula Khan and Kalu Kohar, Hyderabad Division, and in the Dandkhel in the Salt Range with an estimated reserve of about 35,000 tons of ore containing 85 percent $SrSO_4$.

Cement.—Although total production of cement in 1964 increased 7 percent over that of 1962, a shortage of cement still existed in Pakistan. According to the government and reports in the press, cement was selling in West Pakistan between $2.50 and $3.15 per 94-pound bag instead of at the Government-established price of $1.05 per bag.

In May 1964, the first 600-ton-per-day kiln at the Ismail Cement Industries plant at Ghaniwal went into trial production. It was expected to go into full production within 3 months. This project was jointly financed by the International Finance Corporation, which provided $4 million, and the Pakistani Industries Credit and Investment Corp., which provided $3 million. Under construction were the Valika Cement Plant with two kilns of 500-ton-per-day capacity near Karachi and the Pakistan Cement plant with two kilns of 1,500-ton-per-day capacity near Rawalpindi. In addition, the executive committee of the National Economic Council approved in principle the establishment of four more cement factories in West Pakistan at Rohri, San Jaris, Kohat, and Sihi.

A Danish firm, F. L. Smidth, signed an agreement with the West Pakistan Industrial Development Corporation to supply a 15,000-ton-per-year cement plant and ancillary equipment to be built at Dandkhel and two 1,000-ton-per-day kilns at the Zeal Pak Cement Factory at Hyderabad. The two units at Hyderabad were estimated to cost about $15.7 million, whereas the Dandkhel plant was estimated to cost $1.5 million.

Fertilizer.—Pakistan's production of synthetic fertilizer amounted to 300,000 tons in 1964. According to the third 5-year plan, Pakistan will consume 640,000 tons annually by 1967. Apparently to overcome the deficiency, the Government of Pakistan made inquiries in Japan for a 160,000-ton-per-year urea plant to be built near Dacca, East Pakistan, to utilize newly developed reserves of natural gas. At yearend, the only fertilizer producers of the country were the superphosphate plant at Lyallpur with installed production capacity of 6,000 tons per year; the ammonium sulfate plant at Dandkhel with installed capacity of 50,000 tons per year; urea plants at Fenchujani (East Pakistan) and at Multan (West Pakistan) with installed production capacities of 117,000 and 59,000 tons per year, respectively; and an ammonium nitrate plant at Multan with an installed capacity of 103,000 tons per year. Under the third 5-year plan it is planned to increase production by expanding existing plants and installing new plants.

Gypsum.—Increased exploration of West Pakistan's vast known gypsum deposits, containing reserves of over 100 million tons, did not materialize by late 1964. According to a Japanese survey team, the gypsum deposits are primarily in the Salt Range and in the Kohat Salt Range, Peshawar Division, in West Pakistan. Although domestic gypsum demand for fertilizer plants and for construction has increased, details of action taken by the Gypsum Board to meet this demand were not available.

Marble.—In addition to the six cutting and polishing units already operating in different parts of the country, three marble factories were to be established at Jamrud, Swabi, and Naw Shera. Large deposits of constructural and decorative marble found along the northern and western borders of Pakistan will supply the raw material.

Salt.—According to reports of the West Pakistan Industrial Development Corporation, an allocation of $290,000 was made to mechanize salt mining operations in West Pakistan. Detailed geological studies indicate a conservative estimate of workable reserves of 46 million tons at Khewra, 2 million tons at Warcha, and 740,000 tons at Kalabagh. Also it was reported that extensive deposits are present at Bahadur Khel and Jatta quarries. Total export of salt amounted to 57,000 tons in 1963.

MINERAL FUELS

During the latter part of 1964, the Government of Pakistan accepted a $51 million loan from the Canadian Government to build a nuclear power station in Karachi, West Pakistan, with a 100-megawatt capacity. The total cost of this project reportedly will be about $60 million. The power station was scheduled for completion in 1969.

The expected atomic station at Ruppur near Ishurdi in East Pakistan with 70,000-kilowatt capacity was still in the planning stage at yearend 1964. Discussions with Westinghouse Electric Corp. were continued. The primary cost estimate was about $28 million. In the meantime, requirements for commercial energy were met by indigenous coal (23 percent), petroleum (19 percent), natural gas (52 percent), and hydroelectric power (6 percent). Noncommercial fuels (animal and agricultural waste) supplied a significant part of total energy requirements.

Coal.—Coal production continued from the Salt Range and other Pakistani coal centers. Of particular interest was the opening of Ghazij tunnel in Sor Range near Quetta by the West Pakistan Industrial Development Corp. The 4,000-foot-long tunnel, constructed by West German mining engineers, apparently will increase the coal recovery by 90 percent and the output per man-shift from 0.2 to 0.8 ton. The production of Sor Range mines was 450 tons daily in 1964 and was expected to reach 1,000 tons per day in 1967.

Preliminary investigation by diamond drilling, performed by the Geological Survey of Pakistan, reported good quality coal in the Larkana coalfields in the southern part of West Pakistan with an estimated reserve of 300 million tons. The findings of workable coal seams at depths ranging from 2,579 to 3,040 feet with several million tons of reserves also was reported in the Dhananjoypur area of Rajshahi. The Central Industries Ministry considers the coal reserves of Pakistan will suffice to meet domestic consumption for many years to come.

Petroleum.—Production of crude oil reached a new high in 1964. Production came from Attock Oil Co.'s Pakistan oilfields and Pakistan Petroleum's Potwar fields at Khaur, Dhulian, Joya Mair, Balkassar, and Karsal, all in West Pakistan. The higher production in 1964 was due to the increased output from Balkassar, Joya Mair, and Khaur fields, which rose by 121,000, 51,000, and 4,000 barrels, respectively; this output more than compensated for slightly lower production of 21,000 barrels from the Dhulian field and 13,000 barrels from the Karsal field.

In addition to crude oil production from the Potwar fields, Pakistan Petroleum also produced 34,368 barrels of condensate which was extracted from gas produced at its Sui, Sylhet, and Chhatak gasfields. The utilized production of condensate from the Sui field was 2,307 barrels and from the Sylhet and Chhatak fields it was 20,346 barrels.

In November 1964, the Government's Oil and Gas Development Corporation began drilling its first well at Tut in the Potwar area of West Pakistan with the assistance of Russian technicians and using a Russian rig. The Corporation also was due to start drilling in East Pakistan at Jaldi near Chittagong.

Sun Oil began drilling its third offshore well, Korangi Creek No. 1 near Karachi, late in October 1964, while the following two offshore wells were abandoned as dry holes: Dabbo Creek No. 1 at 14,286 feet and Patiani Creek No. 1 at 8,725 feet, both near Karachi in West Pakistan.

Pakistan Petroleum Ltd. reportedly plans to drill six new wells in 1965—three test wells and three development wells. The three test wells will be Kundian No. 1, Adhi No. 3, and Pezu No. 1, whereas the three development wells will be drilled at the Sui gasfields. All three wells are in West Pakistan.

The most significant development in Pakistan petroleum refining was the proposed 500,000-ton plant to be built at Karachi to produce mainly lubricants and asphalt by a wholly Pakistan-owned company, National Refinery Limited, an enterprise of Mohammed Amin Bros. The project will cost $17 million and Pan American International Oil Co. was assisting in the financing and in the design. The crude oil for the plant will come from Pan American's Darius oilfields in Iran. Completion of the plant was expected in 1966.

The capacity of the Pakistan refinery in Karachi was raised to 2.47 million tons of crude oil a year as a result of modifications completed in June 1964.

Natural Gas.—Although Pakistan's natural gas industry has been in production for over 9 years, it continued to produce on a modest scale in 1964, waiting for general economic development and industrial expansion to create new markets. Because of the lack of markets, only 3 of the country's 13 known gasfields were being commercially exploited during the year.

The bulk of the output came from the Sui field in northeast Baluchistan, West Pakistan; the field supplied about 120 million cubic feet of raw natural gas daily. Sui, owned by Pakistan Petroleum Ltd., continued to rank as the nation's largest field on the basis of a new reserve estimate of over 6 million million cubic feet of raw natural gas and was the only operating field in West Pakistan. Burmah Oil Co. held a 70 percent interest in Pakistan Petroleum Ltd., and the Pakistan Government held the remaining 30 percent.

On May 14, 1964, the World Bank made a 20-year loan of $15 million to Sui Northern Gas Pipeline Ltd. (The Pakistani Government, the Pakistani public, and the Burmah Oil Co., all owning equal shares) to be used to extend natural gas distribution lines from the Sui field in central West Pakistan into the northern section of West Pakistan.

The company already supplied south and central sections of West Pakistan. The loan was to help finance the construction of about 510 kilometers of pipeline from Multan to Lyallpur, Lahore, and the Gharibwal-Dandot area. The total cost of the project is estimated to be $59.7 million, and the target completion date was set for the latter part of 1965.

At Multan, West Pakistan, the French group ENSA completed a fertilizer plant late in 1964. The plant reportedly will produce 70,000 tons of ammonia, 100,000 tons of ammonium nitrate, and 60 tons of urea annually.

The six other fields in West Pakistan, all shut in, include Maria, owned by Esso Standard Eastern, Inc., with a reserve of 5 million million cubic feet, and Mazarani and Handhkat with a combined reserve of 3.6 million million cubic feet.

The Government of Pakistan announced late in 1964 that it had reached an agreement with Esso Standard Eastern, Inc., to build a $26 million ammonia-urea complex. Esso will contribute $19 million and will offer 25 percent of the equity to Pakistani investors. The plant is to be built 500 kilometers northeast of Karachi in West Pakistan, and will use natural gas from the Mari gasfields as raw material. Planned annual capacity of the plant was given as 173,000 tons of urea and around 100,000 tons of ammonia. The plant will be built at the edge of the gasfield and will be in production by the end of 1967.

The six natural gasfields of East Pakistan include Chhatak, with a reserve of 20,000 million cubic feet (after dehydration), which provides fuel for a cement plant, and Sylhet, with a reserve of 280,000 million cubic feet, which supplies the Fenchuganj fertilizer plant. Other East Pakistan gasfields, not yet in production, include Rashidpur (740,000 million cubic feet reserve), Kailas, Tila, and Habibganj.

EPIDC and Pakistan Shell Oil Co. signed an agreement in September 1964 to supply the first natural gas to Dacca in East Pakistan. Under the agreement, EPIDC will own 90 percent and Shell 10 percent of a new corporation, the Titas Gas Transmission and Distribution Corp. The natural gas will be supplied from Titas gasfields which were discovered in 1962 and are said to be the largest in East Pakistan, having an estimated reserve of 10 million million cubic feet. It will be carried by a 1,520-kilometer pipeline from the Titas fields to Dacca.

SOURCE MATERIALS

Dispatches from the U.S. Embassy in Karachi have provided partial coverage of 1964 activity, supplemented by interim publications of the Geological Survey of Pakistan and other government agencies. For trade data, only the values of exports and imports were reported; quantitative data were not given, making trade analysis difficult. Information on the production and on natural gas and petroleum was provided in international journals and industrial reports.

Regional Mineral Industry Review of the Far East[1]

By K. P. Wang[2] and J. M. West[3]

◆

SIGNIFICANT general developments took place in the Far East during 1964, with far-reaching repercussions on the mineral and industrial economies of individual countries and the region as a whole. Japan, during this, "the Year of the Open Door," ushered in the era of industrial maturity, greater independence in economic policy, and expanded technical assistance to less developed countries. Symbolic of its dynamic economic growth is the fact that Japan outproduced the Federal Republic of Germany in steel during 1964 to take over a third-ranking world position.

Mainland China, recovering from the "Leap Forward" debacle, made significant gains in industrial output. Mainland Chinese trade with Japan was on the upswing, and discussions were held between the Chinese and the Soviets for possibly resuming Soviet aid in industrial and mineral development. Meanwhile, United States aid to Taiwan was being phased out because of progress achieved. Rapprochement between South Korea and Japan was imminent late in 1964, a factor which may well affect South Korean mineral development. The Indonesian-Malaysian confrontation created economic difficulties in both countries. The war in Viet-Nam seriously disrupted industrial activities, particularly in the south.

The net impact of events in 1964 showed that total Far East mineral output was still advancing. Progress in Japan was outstanding, with overall gain in mineral output value (defined as value of crude minerals plus added value derived from processing domestic and imported ores and fuels) more than 10 percent over that of 1963. Mainland China also made important strides, although starting from a lower base. These two countries overshadowed the others, their aggregate contribution to the regional mineral output value being in excess of 85 percent in 1964. There was great diversity in mineral commodities produced by Japan and mainland China, with the former stronger in processed products and the latter stronger in raw materials. Japan improved its position in steel, refined nonferrous metals, refined oil, and cement; mainland China maintained its prominent international stature in coal and certain traditionally exported metals such as tin, tungsten, antimony, bismuth, and mercury. The rest of the Far East countries provided few products of note in 1964, but generally products were in quantities slightly greater than in 1963; Oil and tin in Indonesia; tin and iron ore in Malaysia; tin in Thailand; nonferrous metals in North Korea; tungsten in South Korea; and refractory chromite and copper in the Philippines.

---

[1] For purposes of this review, the Far East is defined as the general area in eastern Asia southeast of the Soviet Union and east of South Asia (India-Pakistan subcontinent). The Soviet Far East, Australia, and Oceania are not part of this area. Within the so-called Far East, three geographical areas redesignated for convenience in discussions: Southeast Asia (Burma, Thailand, Laos, Cambodia, South Viet-Nam, Malaysia, Indonesia, and the Philippines); Northeast Asia (Japan, South Korea, Taiwan, and Hong Kong); and mainland East Asia (mainland China, North Korea, Mongolia, and North Viet-Nam).

[2] Chief specialist, East Europe-Far East, Division of International Activities.

[3] Physical scientist, Division of International Activities.

During 1964 the Far East supplied roughly one-tenth of the world's iron ore; one-eighth of the steel, coal, and cement; 3 percent of the crude oil; 7 to 13 percent of the major nonferrous base metals; three-fifths of the tungsten and tin; more than a quarter of the antimony and bismuth; one-sixth of the mercury and selenium; a large portion of the graphite; one-third of the pyrite and talc (mainly pyrophyllite); and one-sixth of the salt and fluorspar. Among the basic mineral products, the Far East produced approximately 55 million metric tons of iron ore in 1964, 55 million tons of steel, 360 million tons of coal, 45 million tons of cement, and 250 million barrels of crude oil (about 35 million tons), and 700 million barrels of refined oil. These figures show that, aside from certain countries and certain minerals, the Far East contribution was not particularly noteworthy. In fact, in terms of per capita mineral output and consumption, considering its approximately 1.1 billion people, the region's position was decidedly weak.

Mainly as a reflection of Japanese smelting and manufacturing activities, the Far East was greatly deficient in metallic ores, was nearly self-sufficient in metals, and had a surplus of metallic products. Japan, in addition to importing base metal ores from nearby Far East countries during 1964, continued to obtain large ore supplies from other parts of the world, particularly from Australia and Latin America. In contrast, mainland China was self-sufficient in most minerals and fuels. The Far East as a whole had enough coal, aside from supplementary coking coal needed by the Japanese steel industry. Virtually all of the cement produced was consumed within the region, with some Japanese surpluses going to other Far East countries. Oil continued to be extremely short in 1964, Japan's ever growing demand being satisfied by crude imports, mainly from the Near East; most of the Indonesian crude oil output was refined and consumed in the Far East.

SOUTHEAST ASIA

Southeast Asia, a heterogeneous area with varied economic, political, and cultural background, went through a turbulent year of general uncertainties related to the deteriorating Far East situation. Mineral activities in South Viet-Nam, with limited potential to start with, were at a standstill in 1964. Laos was not able to do anything with its extensive iron ore discovery. Nothing of note took place in exploiting Cambodian minerals, although the Chinese Communists were helping to build some small construction material plants. Burma, traditionally apprehensive of its northern neighbor, continued to bar foreign investment in its policy of neutrality and made hardly any progress in developing its considerable mineral resources. In contrast, Thailand made some headway in, for example, its tin and antimony enterprises. Although general economic development in Malaysia was hurt by the crisis with Indonesia, the tin industry flourished and iron ore output nearly held its own during 1964. Inflation was rampant in Indonesia because of political problems, but the big concern was government oil policies. Although the Philippine peso position was weakened, copper exports and overall mineral consumption continued to rise.

Because of limited mineral production and inability to develop available resources, Southeast Asia's special contribution to the world mineral economy was confined to a few items during 1964. Nearly half of the world's tin came from this area, with its position strengthened through increased smelting capacity. Southeast Asia was still the world's foremost refractory chromite producer, although its output was at lower levels than a few years ago. Tungsten output remained in the doldrums, and manganese extraction was haphazard. Iron ore and copper concentrate produced in the area represented less than 1.5 percent of the world's supply in 1964. The forenamed minerals were primarily exported, principally to Japan but also to the west. A few mineral products for local consumption made some headway. Output of crude petroleum, amounting to about 2 percent of the world total, roughly satisfied local demand, and more refining capacity was being added. Cement output also increased in 1964, although still aggregating not much more than one-half percent of the world supply. A number of steel processing plants were being built or were under consideration. However, the coal base remained weak.

Indonesia's mineral industry appeared to improve in 1964, with higher outputs of oil, tin, and bauxite. However, the country's economic troubles multiplied, and mining was hampered by high labor costs, broken-down equipment, and inadequate planning. Oil companies exploited oilfields at maximum rates, together producing almost 171 million U.S. barrels of crude oil in 1964. Tin mines were being reequipped through West European financing. Indeterminate Sino-Soviet aid supported lagging construction of iron and steel works, small cement plants, and fertilizer facilities. Tin output was one-fourth higher than in 1963, higher world prices being a factor. A well-planned United Nations Special Fund program for tin development studies was discontinued because of Indonesia's forthcoming withdrawal from the United Nations. Output of coal and cement fell because of equipment and management difficulties. The year's major interest was the construction of a 25,000-ton-per-year tin smelter at Bangka. Its progress met with unexplained delays, although tin ores reportedly were being stockpiled late in 1964 for refinery runs. Confrontation severed Malaysian trade so Indonesia had turned from Penang, Malaya to the Netherlands for smelting tin ores. Erection of the 100,000-ton-per-year Tjilegon steel plant, West Java, progressed slowly. The plant will consume scrap. Nickel was on an upswing with development of deposits by Japanese and Netherlands companies under government profit sharing. Oil companies vied for newly offered oil concessions, and Japan arranged to purchase crude oil in increasing quantities through an export company formed in partnership with the Indonesian Government.

Malaysia's foremost mineral product, tin, which normally constitutes a third of the world's output, hit the 60,000-long-ton-per-year level for the first time in 1964. In response to high tin prices, mines were reopened, new land was released for prospecting, and offshore activities increased, portending even high production. Tin refining was at a lower pace, because Indonesian ore was being diverted to the Netherlands. A new 750- to 1,000-ton-per-month Japanese-Malaysian tin smelter at Kulan became operational. The decline of iron ore production in 1964 was caused by a landslide at the Buket Besi (Dungan) pit; meanwhile, extensive development took place at the Buket Ibam (Rompin) pit and the nearby Pasaki deposit. Bauxite from Johore and Sarawak was extracted at slightly higher rates for the export market. Two new cement plants were completed in the Ipoh area, and a third was nearly completed in Singapore. Various steel fabrication facilities came into being, and a major steel plant (Malayawata Iron and Steel Co.) has been planned at Prai near Penang. Prospects for mining Sarawak coals were improved, providing insurgent harassment could be controlled. Oil output from the independent State of Brunei was at about the 1963 level. A 24,500-barrel-per-day oil refinery (Esso Standard, Ltd.) came on stream at Port Dickson, Malaya; and an 18,000-barrel-per-day refinery was under construction at Jurong, Singapore.

Thailand produced about 8 percent of the world's tin in 1964, only a slight increase over the 1963 level despite high tin prices. Many mines were reopened or reequipped, however, so that future prospects looked bright. Construction began on a United States (Union Carbide Corp.)-Thai 15,000-ton tin smelter on Phuket Island; the operators were given favorable terms with regard to ore supply and offshore concessions. The first Thai oil refinery (36,000 barrels per day) came on stream at the seaport of Sriracha. Oil prospecting continued in the northeast, and offshore surveys were proposed. Cement capacity was expanded. Not much tungsten was extracted, but activity increased in manganese ore mining. Thai fluorspar and antimony output gained world significance in 1964. Steel and galvanizing plants were either planned or under construction; coal (mainly lignite) and hydropower developments made more electrical power available in the north and south. Iron ore deposits in the Loey area in northern Thailand showed good promise, and United Nations studies were in progress to determine potentials not only for iron but also for nonferrous base metals.

Burma's mineral production was sluggish, with government attention given to other things, such as nationalization. Oil, the leading mineral product, made hardly any gains in 1964, and more crude had to be imported to meet refinery needs and rising consumption. The Bawdwin nonferrous base metal enterprise went through a steady year of operations and, with favorable results of a United Nations ore reserve study, a new lead-zinc smelter was under consideration. Continued participation of the British-United States-owned Burma Corporation in Bawdwin operations was uncertain at yearend, as nationalization was pressed. Iron ore and low-rank coal resources were being studied for a possible steel plant, a fertilizer plant was listed for construction, and the Mawchi tin-tungsten mine was once more being rehabilitated. Burma received aid in mineral resource development from non-Communist and Communist nations alike while restricting private foreign investments.

The Philippine mineral industry made significant advances in 1964, despite slightly reduced output in copper. Prospects for even higher overall production in 1965 were excellent. The corporation law scheduled termination of the Laurel Langley Agreement in 1974, and obscurities in the Mining Act, however, stood in the way of large, long-term foreign mineral investment. A large copper project on Marinduque Island, of interest to American-Canadian investors, bogged down. Although the Surigao nickel law was made more attractive, there were still no foreign bids to develop the extensive nickeliferous laterites. The Zambales Mineral Reservation refractory chromite mine of Consolidated Mines, Inc., started operations, and the firm's 1964 production rose somewhat to 426,000 tons. At the Atlas copper mine on Cebu, a deep shaft was completed and a November typhoon caused great damage to the Lutopan pit. Typhoon-caused landslides were primarily responsible for the decline in Philippine mine copper output of 5 percent to 60,489 metric tons in 1964. At the Lepanto copper-gold enterprise the company began to expand mill capacity from 1,300 to 2,000 tons of ore per day. At the Sipalay copper operations on Negros, a second Sauerman Dragscraper was put into use at the new Cansibit pit. A pyrite concentrator was going in at the Bagacay operations on Samar to supply pyrite to ESSO Standard Fertilizer & Chemical Co., Inc.'s, large plant being built on Bataan. The Benguet and Lepanto enterprises were responsible for a notable rise in gold output.

The Larap iron mine began work on a 750,000-ton-per-year pelletizer plant, with a view to selling pellets to the projected integrated steel plant at Iligan, Mindanao, for which a $62.3 million loan was secured. Construction of a second steel mill (with an initial capacity of 250,000 tons per year) in Sta. Ines, Rizal, to use nearby iron ore from Antipolo was decided upon, with pelletizing, blast furnace, and oxygen converter operations in mind. Cement output rose sharply to 1.06 million tons in 1964, with three plants added. Outputs of mercury and zinc declined, whereas manganese and byproduct molybdenite showed little change. Oil-drilling activities were severely curtailed at yearend; in contrast, more crude oil was imported and refined to meet the steadily rising demand.

NORTHEAST ASIA

Northeast Asia was characterized by considerable political stability and significant economic progress during 1964, with minerals playing a vital role. Achievements can be primarily attributed to Japan, which showed an industrial production growth of about 17.8 percent over that of 1963, and an increase of overall trade of about 12 percent over the previous year. The mineral industries, through exploiting domestic resources and processing both indigenous and imported raw materials, were directly responsible for more than one-tenth of Japan's 1964 gross national product (GNP). Although dwarfed by Japan, important advances also were made elsewhere in the area. Taiwan's 1964 industrial production index was more than one-fourth greater than the 1963 index; to a significant degree this was made possible by the greatly expanded natural gas and power industries. South Korea achieved a modest 6-percent increase in the overall industrial index, with minerals, cement, and power making substantial gains. Hong Kong's industrial advancement was primarily in the light industries, but consumption of minerals, metals, and fuels increased notably.

Japan's mineral and industrial activities extended far beyond its borders in 1964 and, in fact, covered many places in the Pacific basin. Its position in Southeast Asia, as a developer and purchaser of mineral raw materials and supplier of equipment and plants, technicians and funds, and manufactured products, remained about the same as in previous years. However, similar activities and outright purchases of raw materials elsewhere in the world were clearly on the increase, even between Japan and Communist countries. The most important trading and business partner was the United States. In 1964, exports totaled $1,854 million with steel products as the leading Japanese mineral commodity export to the United States and imports totaled $2,335 million with steelmaking and fertilizer raw materials as significant Japanese import items from the United States. Very large mineral purchasing contracts also were signed with Australian firms (some with United States capital) during the year, and mineral trade with and investments in Canada and Latin America were at higher levels.

The international nature of Japan's mineral economy should not obscure the strong domestic base, particularly in terms of smelting and processing capability and local industrial demand. Primarily based on imported raw materials, Japan's steel output increased by more than one-fourth over that of 1963, with the bulk of the increase in oxygen converter steel. All major steel producers improved operations at existing plants in 1964 while building new steel centers. For example, Yawata Iron & Steel Co., Ltd., Japan's leading steel and industrial firm improved daily output at the not-so-old Tobata Works where the No. 3 blast furnace of 1,947 cubic meters was nearing the level of 4,000 metric tons of pig iron at yearend 1964. Meanwhile construction moved ahead at the new Sakai Works near Osaka where an even larger blast furnace and two 150-ton oxygen converter furnaces were being built. The other steel companies expanded activities in a similar manner during 1964.

With regard to Japan's nonferrous metals, major events occurred both in the resource and smelting areas. By mid-1964, about 60 million metric tons of very high-grade but complex nonferrous "black" ores reportedly had been delineated in northern Honshu. Two large and modern nonferrous smelters were being built during the year—a copper smelter at Onahama in Fukushima north of Tokyo by the Mitsubishi Metal Mining Co., Ltd. (and other companies), and a lead-zinc smelter using the Imperial Smelting Process near Kobe by the newly formed Sumitomo ISP Company. A third large smelter to process lead within the present confines of the Naoshima Works was being planned by Mitsubishi Metal jointly with Canadian interests. Japanese aluminum companies received the first large shipments of Australian bauxite in 1964.

In the fuels area, a continued shift from coal toward oil was evident for Japan. Coal output declined slightly, whereas oil imports rose appreciably. Japan's oil refining capacity at yearend 1964 was rated at 1,822,000 barrels per day, an increase of one-fifth over that at year-end 1963. One large refinery in the Niigata area was incapacitated by the mid-year earthquake, but two new ones—Ohita and Owase (both 40,000 barrels per day)—came on stream and at least four others were expanded. In 1964, Japan became the third largest world consumer and refiner of oil, although a distant third.

South Korea's achievements in mineral production were notable in anthracite (9.7 million tons), an increase of nearly 9 percent, and cement (1.2 million tons), an increase of 60 percent compared with 1963 figures. Iron ore and flourspar output was much improved but tungsten, for which the country is noted, showed no improvement in 1964, despite higher world prices, with the prime source, Sangdong, operating below capacity. Bismuth and molybdenum were important tungsten byproducts, with increased recoveries being made of the molybdenum. Changhang, the lone base metal smelter, saw a number of improvements, and a modern lead refining section became operative. Three new cement plants which eased shortages, went into production, making five plants in all in addition to a clinker grinding plant. South Korean output of graphite, a sizable but mostly low-grade item, decreased as demand lowered. Fertilizers were primarily dependent on imports, thus great effort was going into establishing a domestic fertilizer base. South Korea's first oil refinery (35,000 barrels daily) began operation at Ulsan in 1964, processing imported crudes. The United States continued to actively assist Korea's Government in mineral surveys and studies connected with resource development. Relations with Japan appeared on the verge of normalizing which would provide a more favorable setting for Japanese investment and trade.

Taiwan's most important mineral development in 1964 concerned the sizable natural gas deposits recently discovered in the Miaoli area. Gas-handling facilities were completed, and production jumped to about 6 million cubic feet or nearly four times the 1963 level. Expanded use of this gas is imminent as a source of energy and raw material for making petrochemicals and fertilizers. The roughly 5 million tons of coal produced annually remained the country's basic fuel. Should Taiwan build an integrated steel complex and more power facilities according to plan, demand for coal could exceed supply. The existing small, scrap-based steel industry was not large enough to meet requirements. Taiwan was the only small Far East country with an aluminum reduction plant (at Kaohsiung); aluminum output based on imported bauxite nearly doubled in 1964, and a growing number of aluminum fabricating mills were being built. Extensive limestone resources contributed toward the rapid growth of Taiwan's cement industry, which sold two-fifths of its 1964 production abroad. Increasing demand for fertilizers in agriculture led to high priority being given to building new plant capacity. Recently completed facilities made Taiwan virtually self-sufficient in nitrogenous fertilizers. The oil refinery in Kaohsiung, based upon imported crude, was expanded in 1964 as part of a long-range plan to develop a petrochemical industry.

Hong Kong produced only one primary mineral product of any consequence in 1964—iron concentrate from the Ma On Shan mine located in the New Territories on the mainland. Output was merely 114,000 tons, worth about $1 million; all of this tonnage was shipped to Japan. Consumption of mineral-metal products and fuels however has been more significant. For example, the colony imported nearly 0.4 million tons of steel products, about 1.8 million tons of cement, and 14 million barrels of refined oil during 1964. Sizable shipbreaking and scrap-iron activity continued in Hong Kong. A cement plant using imported clinker was in operation. Small aluminum rolling and extrusion mills and copper and brass workshops have been built. A large-diameter steel pipe plant was completed late in 1964 and a small, continuous steel casting plant was being constructed.

MAINLAND EAST ASIA

Mainland East Asia, comprising four contiguously located Communist countries centered around mainland China, went through a year of moderate industrial advancement, somewhat affected by the pressure of warfare in Viet-Nam. Mineral industries were given high priority in economic development. In mainland China during 1964, particular attention was assigned to radioactive materials, petroleum, coal, steel, and construction materials. Chinese output of most mineral products were either about the same level or significantly higher than in 1963, indicating that the economic rationalization program had met with some success. On a much smaller scale, but important on a unit area basis, are the mineral developments in North Korea and North Viet-Nam, the industralized sections of the now separated countries. North Korea's diversified mineral industries made an overall gain in output value of about 10 percent over that of 1963, with coal, iron ore, and steel leading the way. In 1964, North Viet-Nam's industrial output value was on a par with agricultural output value for the first time. Mongolia's small mineral industry was sluggish in 1964, but an industrial complex in the Darkhan area near the Soviet Union was being built.

Mainland China's mineral industries remained primarily domestically oriented in 1964, although some few shortages were supplemented by imports and traditional mineral exports were being pushed. All mineral products of high total value were being produced mainly for the local economy. Output of coal, the country's foremost mineral commodity, increased and was only surpassed by that of the Soviet Union and the United States. The quality of coal produced was improved and extraction was carried out at more locations than in the previous year. An additional 30 to 50 million metric tons of annual coal capacity was being developed in 1964. A major project completed during the year was the more than 6-million-ton annual capacity P'ingtingshan coal mines in Honan Province, which placed its No. 10 colliery and necessary coal washeries in operation. New shafts and beneficiation plants also were added to many established coal centers.

Although oil has only a minor role in the country's energy economy, it remained indispensable and the potential appeared more promising than a few years ago. The Chinese made statements in 1964–65 to the effect that the country had become nearly self-sufficient in oil; that its 1964 oil output was one-fifth higher than in 1963; and that it may be expected soon to produce 10 million metric tons (more than 70 million barrels) annually. At the Tach'ing (literally meaning "big celebration") oilfield northwest of Harbin, in particular, there was a surplus of crude oil due to a temporary shortage of refining capacity. Oil prices at refineries were reportedly reduced, implying better overall supply in the country. In connection with the energy field, the country's most significant development was the explosion of mainland China's first atomic bomb on October 16, 1964.

The Chinese steel industry, ranking about seventh in the world resumed some basic construction in 1964. It showed clear signs of higher and better quality production and increased utilization of available facilities. Steel output was considerably higher than the previous year, judging from fragmentary reports concerning steel centers plus trade information. Operational practices were improved and many more steel products were made. Over fulfillment of targets was claimed for the 5-million-ton steel Anshan enterprise, the country's largest and most established center. Production and construction at Wuhan was on schedule. A large ore concentrator was being constructed at Paotou. Several Shanghai steel plants reported higher output and a galvanizing plant was placed on operation. Taiyuan has been built into a moderately sized integrated steel center. Mainland China exported about 1 million metric tons of pig iron to Japan in 1964.

Nonferrous base metals apparently did not fare as well as steel, although some gains in output were claimed. During 1964, new mining and metallurgical projects were reportedly under construction for manganese, magnesite, copper, lead, zinc, aluminum, and tin. The Chinese inquired about Japanese assistance in building aluminum facilities and offered to sell molybdenum concentrate to Japan. The "export metals" seemingly did not fare too well in the international markets; outlets were sought to substitute for the reduced Soviet purchases.

The Chinese cement industry probably increased output only slightly, although new developments were reported for at least a dozen plants. The country has been exporting on the order of 1 million tons of cement annually in recent years or close to 10 percent of the output. The asbestos industry expanded output considerably, and traditional exports like high-grade talc and fluorspar were being extracted at the 1963 levels. Much emphasis was placed on developing fertilizers and chemical raw materials as well as importing these products and the plants to make the products.

North Korea, with a relatively well-developed mineral base, world famous for tungsten, graphite, and magnesite but also producing significant quantities of coal, cement, iron ore and iron and steel products, lead-zinc, pyrite, barite, and lesser minerals, put forth a special effort in 1964, successfully expanding and modernizing its fair-sized mining and processing facilities. Output of coal, mainly anthracite, increased sizably to 15.5 million metric tons in 1964. Large gains apparently were made in iron and steel, outputs of iron ore increased one-fourth and those of steel ingot one-tenth. Musan, the large iron mine in the north, registered a major expansion and supplied a large tonnage of ore to Japan. Fertilizers and chemicals, associated with coal and metallurgical operations, underwent intensified development.

Several new fertilizer plants were on order or under construction; domestic phosphates and pyrites provided a firm resource base. Metallurgical capacities for copper, lead, zinc, and byproducts expanded as work continued on new and renovated refineries. Coal and hydroelectric power were emphasized in the energy sector more than oil for which supplies depended on Soviet sources. Ambitious projects were underway on hydroelectric plants and countrywide electrical distribution networks in 1964. A sizable mineral trade was carried on with adjacent China and the U.S.S.R., and such trade with Japan and possibly other nations was on an upswing.

North Viet-Nam's efforts to industralize, based mainly on mineral resources, made considerable headway in 1964, despite imminent disruptions on account of the Viet-Nam war. Output of more than 3 million tons of high-grade anthracite from the famous Hongay field was a little above the 1963 level; a large expansion program was envisaged for 1965. Output of apatite from the extensive Laokay deposits near the Chinese Yunnan border was about 2 percent of the world phosphate ore production. The Co Dinh mine continued to provide good grade metallurgical chromite. Additional nonferrous metal deposits and fertilizer plants were developed. With Rumanian help, construction of a sizable cement plant moved ahead. Development of the new 200,000-ton-per-year steel complex at Thai Nguyen north of Hanoi was well underway, with the second blast furnace completed and a third one started in 1964.

Mongolia produced only one mineral product of world consequence in 1964, namely fluorspar at a slightly higher level than in 1963. Its small mineral industry was otherwise merely of local significance, as the country turns to industrialization. Coal was the main mineral product, and the hope is to produce up to 2 million tons annually in the not-too-distant future. A sizable industrial complex was being developed in the Darkhan area north of Ulan Bator during 1964, to draw on raw materials, nearby, such as coal from Sharyn Gol, iron ore, clays, sands, and limestone from other areas.

The Mineral Industry of Burma

By J. M. West[1]

◆

ALTHOUGH long considered a rich mineral region, Burma remained only a small producer in 1964, with its mineral industry output worth on the order of $45 million,[2] slightly less than that of neighboring Thailand. Oil was the mainstay, but even that fell short of supplying domestic energy demands. Oil production, dropping in 1964, could not keep pace with consumption, and the lack of new discoveries made the outlook discouraging. The future for base metals and tin-tungsten mining was somewhat poorer, because efficient extraction had been abandoned for highgrading practices, thus hastening early depletion. Compared with agriculture, minerals had a small place in the economy, but contributed about 3.5 percent to the gross national product. Several thousand of the country's 24 million people were involved in mineral extraction, with facilities concentrated at only a few sites.

Oil exploration was stepped up in 1964, largely with Rumanian help; expanded operations at the Syriam refinery made crude imports necessary, indicating the shortcomings in domestic supply. Burma Railways' dieselization was nearly complete, reducing demand for imported coal but increasing diesel oil requirements. A tender was issued for construction of a Government fertilizer plant; meanwhile drilling to find adequate natural gas for the proposed plant proceeded in the Chauk area. Burma Corp., the big nonferrous metal producer, was seeking exemptions from taxation and stringent Government controls. Surveys at the company's Bawdwin mines had disclosed large tonnages of lower grade multimetal ores, and plans were being made to expand output. The Mawchi tin-tungsten mines and Kalewa coal mines were small-scale developments in progress, and a large iron deposit near Pangpet was being studied. Gem mining was hard hit by insurgency. To stimulate the gem trade, the Government tried to take the traditional role of Hong Kong dealers in jade purchases but with little success. Offerings under Government supervised sales at the Rangoon Gem Fair in December fell short as producers balked at the new controls.

---

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from kyats (K) at the rate of K4.72 equals US$1.00.

GOVERNMENT POLICIES AND PROGRAMS

Main attention was given to socialization and nationalization by the military dominated Government in 1964, its third year of control. The Government took a tighter grip on trade by placing all exports under control of the nationalized Myanma Export-Import Corp.; this agency also was scheduled in June to take over licensing of jade and gem mines. All industrial supplies were handled by People's Stores Corp. through its Industrial Raw Material Distribution Committee. Foreign loans and technical surveys were welcomed; however, foreign private investment was not encouraged. In January 1964 the Foreign Capital Assistance Supervisory Committee was set up to manage allocation and utilization of incoming aid grants and loans. Generally such funds were from East European and United Nations sources. Petroleum and Mineral Development Corp. (PMDC), which includes the agencies formerly concerned with mining, by yearend held virtual complete control over mineral production and marketing. People's Oil Industry (POI), formerly Burma Oil Corp., was set up apparently as a subordinate organization to PMDC for handling activities in the petroleum sector. Colonel Than Sein, appointed late in 1963, held the post of Minister of Industry, Mines, and Labor.

PRODUCTION [3]

The mineral industry's 1964 contribution of an estimated $45 million to Burma's economy was about the same as in 1963. Incomplete data for the year indicated that output levels for most minerals were declining, but because of better world metal prices, overall value was expected to show little change. Petroleum and natural gas accounted for slightly over half of the value; nonferrous base metals and tin-tungsten, basically export commodities, made up about one-fourth. Production and transportation in some areas were hampered by insurgent activities. Lead-zinc-silver output from the Bawdwin mines appeared to be on an upturn despite growing fear about impending Government takeover. Cement output was stable; the single plant at Thayetmyo operated at capacity. About three-fourths of the total mineral output value was accounted for in domestic consumption.

---

[3] The Revolutionary Government of the Union of Burma, Central Statistical and Economics Deparment (Rangoon, Burma). Selected Monthly Economic Indicators. September and October 1964, 23 pp.

TABLE 1.—Burma: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Antimonial lead (18 to 20 percent antimony)[1]	539	413	459	578	[2] 236
Antimony ore (40 to 50 percent antimony)	212	151	68	NA	NA
Copper matte (40 percent copper)[1]	365	279	370	NA	[2] 155
Gold, refined ..... troy ounces	304	194	[e] 200	[e] 200	[e] 200
Iron and steel:					
Iron ore	15,922	[e] 15,000	9,162	NA	NA
Steel ingot [e]	5,000	11,000	13,000	15,000	15,000
Rolled steel [e]	4,000	8,000	10,000	12,000	12,000
Lead:					
Concentrate (50 to 60 percent lead)[1]	32,107	29,007	33,449	32,936	[2] 15,740
Refined metal (99.99 percent lead)[1]	16,782	15,763	17,385	17,738	18,053
Manganese ore	294	178	193	[e] 200	NA
Nickel speiss (20 to 22 percent nickel)	332	650	536	462	[2] 147
Silver, refined[1] ..... thousand troy ounces	1,501	1,325	1,498	1,511	[2] 672
Tin concentrate (68 to 72 percent tin) ..... long tons	1,043	1,030	909	795	[3] 488
Tin-tungsten concentrate (35 percent tin and 30 percent tungsten trioxide) ..... long tons	1,122	1,222	1,161	1,279	[3] 425
Tungsten concentrate (55 to 65 percent tungsten trioxide)	354	378	215	89	[3] 40
Zinc concentrate (54 to 56 percent zinc)[1]	18,028	13,122	15,119	15,224	[2] 8,023
Nonmetals:[4]					
Barite	1,626	2,039	4,048	NA	NA
Cement	44,901	39,570	53,282	124,130	131,000
Gypsum	1,052	853	2,084	NA	NA
Limestone	40,000	36,065	65,289	NA	NA
Marl	24,016	23,171	26,293	NA	NA
Salt	148,181	126,544	155,697	160,700	127,000
Mineral fuels:					
Coal	114	1,611	2,423	[e] 5,000	[e] 8,000
Natural gas ..... million cubic feet	261	333	440	NA	NA
Petroleum:					
Crude oil ..... thousand 42-gallon barrels	4,078	4,218	4,366	4,761	4,277
Refinery products:[5]					
Gasoline ..... do	1,250	1,312	1,292	1,238	[3] 937
Kerosine ..... do	687	718	702	854	[3] 620
Other ..... do	882	1,260	1,229	1,280	[3] 1,020
Total ..... do	2,819	3,290	3,223	3,372	[3] 2,577

[e] Estimate. NA Not available.

[1] Output of Burma Corp. (1951), Ltd. All figures tantamount to national production; however, other companies sporadically produce small quantities of lead, zinc, and silver.

[2] January–June.

[2] January–June.

[3] January–September (preliminary).

[4] Burma also produces a variety of semiprecious and precious stones, including amber, jade, ruby, sapphire, and spinel.

[5] 1960–61 figures are for fiscal years, October to September of subsequent year. For 1962 and 1963, residual fuel is apparently not included and "other" is comprised mainly of distillate fuel.

TRADE[4]

Among Burma's exports from October 1963 to June 1964 only minerals showed an increase, according to preliminary figures. Metal and ore exports for fiscal 1963–64 (October–September) indicated an approximate annual shipment value of $10 million, equivalent to 3.5 percent of all exports, compared with 70 percent for rice. Once a petroleum exporter, Burma in 1964 was importing both crude and refinery products and exporting only the petroleum wax from refining. Exports of tin and tungsten ores and concentrates reportedly no longer moved through the Tenasserim ports of Tavoy and Mergui but instead through Rangoon.

Since nationalization of all incoming trade, imports except those for Government departments were handled by the People's Stores

---

[4] Work cited in footnote 3.

TABLE 2.—Burma: Exports of metals and minerals

(Metric tons, unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Antimony ore	240	22	NA.
Copper matte	405	239	Japan, West Germany.
Lead:			
Ore (galena)	457	457	All to Japan.
Metal:			
Antimonial lead	336	494	All to India.
Refined	19,999	16,301	Mainly to India.
Nickel speiss	---------	423	Japan.
Silver bullion...thousand troy ounces	1,401	1,251	Mainly to United Kingdom.
Tin and tungsten:			
Tin ore and concentrate [1] long tons	1,885	[2] 1,267	Mainly to Malaysia; also to United Kingdom.
Tungsten ore and concentrate	417	[2] 376	Mainly to Japan.
Mixed tin-tungsten concentrates long tons	260	393	Japan, United Kingdom, Netherlands.
Tin ingots...long tons	26	---------	
Zinc:			
Ore and concentrate	[r] 15,700	[r] 17,280	Japan.
Ingots	---------	50	NA.
Nonmetals: Salt	9,380	[e] 10,000	Virtually all to mainland China.
Mineral fuels: Petroleum wax	10,896	11,202	Mainly to United Kingdom.

[r] Revised. [e] Estimate. NA Not available.

[1] Includes several tons of bismuth-bearing concentrates.

[2] Incomplete. Exports from ports of Tavoy and Mergui, near the main tin-tungsten area, are not available.

TABLE 3.—Burma: Imports of metals and minerals

(Metric tons, unless otherwise specified)

Commodity	1962	Principal sources
Metals: Unwrought	464	Canada 435.
Aluminum: Semimanufactures	2,750	Mainland China 1,660 [1]; Japan 320.
Copper semimanufactures	530	Belgium 154; U.S.S.R. 131.
Iron and steel semimanufactures:		
Iron ingots	2,140	Australia 2,000.
Joists	5,220	Belgium 1,710; U.S.S.R. 1,510; Japan 850.
Bars and rods	37,000	Japan 14,700; U.S.S.R. 9,620; Belgium 4,960; mainland China 3,010.
Uncoated plates and sheets	8,050	Japan 4,480; U.S.S.R. 1,580.
Galvanized and corrugated sheets	19,600	Japan 12,000; Australia 6,270.
Tinplate	9,870	Japan 8,640.
Wire	4,430	Mainland China 1,600; Japan 1,045; U.S.S.R. 705.
Tube and fittings	9,605	United Kingdom 6,020; Japan 1,780.
Large pipes	3,860	Japan 2,880; mainland China 254.
Zinc semimanufactures	514	Australia 330; Belgium 79.
Nonmetals:		
Asbestos	500	Republic of South Africa 260; Canada 240.
Cement...thousand tons	130	Mainland China 56; United Arab Republic (Egypt) 17; Japan 14.
Fuller's earth	995	India 540.
Phosphate fertilizer	6,900	Japan 6,790.
Sulfur	1,490	United States 1,400.
Mineral fuels:		
Coal...thousand tons	330	Republic of South Africa 284.
Coal coke	1,160	All from Republic of South Africa.
Petroleum:		
Gasoline...thousand 42-gallon barrels	123	Iran 79; U.S.S.R. 44.
Kerosine...do	123	Mainly from U.S.S.R.
Medium flash diesel oil...do	104	Mainly from U.S.S.R.
High flash diesel oil...do	211	U.S.S.R. 186; Iran 24.
Lubricants	108	United Kingdom 65; Netherlands 23.
Asphalt	20,050	Iran 13,340; Republic of South Africa 4,570.

[1] Mostly aluminum circles.

Source: Official trade returns of Burma.

Corp. Values both of mineral and overall imports from October 1963 to June 1964 were below those of the corresponding 1962–63 period partly due to Government restraints. Roughly $40 to $50 million worth of mineral and related products was imported in 1964, principally metals and semimanufactures. Cement, coal, and oil imports were worth about $0.5, $3, and $4 million, respectively in 1964.

COMMODITY REVIEW

METALS

Lead, Zinc, and Silver.—It was announced that Burma Corp., Ltd. (1951), the country's only important base metal producer, would become fully nationalized, effective January 18, 1965. The company, employing about 5,700 people, had been a 50–50 joint venture of the Government and Burma Mines, Ltd. (London), the latter 49 percent American-owned, with shares held by Morgan Guaranty Trust Company (New York). The Government complained that the company was mining only high-grade ores, leaving behind less profitable but economically mineable ores. The company claimed that exceptionally high tax rates had made it impossible for it to work the mine profitably. A commission was appointed to assess the value of Burma Corp. shares and determine stockholders' compensation.

During the corporate year ending June 30, 1964, Burma Corp., with its Bawdwin mines and Namtu smelter, treated 169,000 tons of ore, recovering 17,200 tons of refined lead, 15,600 tons of zinc concentrates, and 1.44 million fine ounces of silver.[5] Although tonnage was only slightly higher than a year before, zinc recovery was almost 10 percent higher; lead and silver stayed about the same. Ore grade in the first half of 1964 was about 12.5 ounces per ton in silver, 15 percent lead, and 8 percent zinc. Insurgents continued to harass shipments from Namtu. During the 9 months ending June 30, an estimated surplus of $212,000 was declared on Burma Corp. gross revenues of $6 million.

Results from a Burmese and United Nations Special Fund study indicated Bawdwin mine reserves could keep operations going at least another 20 years; it was suggested that earnings could be doubled with adequate investment, which could lower production costs per ton from $35 to between $10 and $15. A U.N. team was asked to advise on establishing a modern lead-zinc smelter.

Iron and Steel.—Proposals to build an integrated iron and steel plant were reinforced by a West German survey that disclosed deposits near Pangpet, Shan State, containing 10 million tons of ore averaging 56.4 percent iron and 59 million tons averaging 42.6 percent iron. Small deposits at Kawloikaw, near Taunggyi, at Inga, near Maymo, and on Mah Putch Island, near Mergui, were considered inferior. Possibilities for steel production were linked with the Kalewa subbituminous coalfield, with estimated reserves of some 128 million tons of coal.

Steel demand in 1964 centered on galvanized sheets, a large share of which were imported from Japan. The Ywama, Insein, electric steel plant produced rolled and wire products from dwindling domestic scrap supplies. Annual capacity was 20,000 tons of ingots, 40,000 tons of rolled products, and 8,000 tons of galvanized sheets. Expansion was planned or underway, and an international tender was placed for galvanizing facilities totaling 60,000 tons annual capacity.

---

[5] Company reports through quarter ended June 30, 1964.

Tin and Tungsten.—PMDC's rehabilitation program to boost tin-tungsten production at the once famous Mawchi mines, in southern Shan State, from about 30 to 100 tons of ore per month appeared to be making headway; output in fiscal year 1963–64 was estimated at 550 metric tons of mixed concentrates. Earlier in 1963, the Government had acquired Anglo-Burma Tin Co., Ltd's., remaining 49 percent share in the operations. The Yawa (Yawa Tin Lode Mine Co.) and the Kyaukmedaung (Tenasserim Mining Co.) tin mines were nationalized in early 1964. Private mining was discouraged by supply problems and controls; 6 tin mines in the Mergui and Tavoy areas had stopped production, and active tungsten mines declined to about 30, one-third less than a year before. Although reports on mining output conflicted, tin and tungsten production appeared to be slowly improving.

MINERAL FUELS

Coal.—Burma's Kalewa coalfield, being developed as part of a 5-year plan (1963–68) under West German technical supervision, produced about 25 tons of coal per day. A coal cutting machine was purchased, and arrangements were made for installation. Output from development workings totaling 7,000 metric tons from October 1963 to July 1964 went to the Government Brick and Tile Factory and Burma Railways.

Petroleum.—Oil production, although on a rising trend until 1964, was only about half the pre-World War II rate, and crude imports were required in 1964 to meet expanded operational levels in refining. Refinery outputs in barrels daily were Syriam—20,000, Chauk—6,300, and Yenangyaung—1,700. A new crude distillation unit was opened at Syriam shortly before the first of the year, and the old section of the plant (about 6,000 barrels daily), was placed on standby. Domestic crude production was about 15 percent short of supplying the various products consumed; more diesel was especially needed. Refining produced an excess of paraffin for export. Indonesia supplied most of the additional crude imported to fill out refinery operations.

With Burma's oil reserves declining, the People's Oil Industry (POI), successor to Burma Oil Corp. (nationalized in 1963), was receiving Rumanian and Japanese exploration assistance. Several Rumanian drill rigs explored for gas in the Chauk area to provide for a proposed fertilizer plant. POI, completing its oil monopoly, nationalized five small private producer-distributors. Small strikes of oil and gas were made in the Inma area at depths of 3,340 and 11,540 feet; oil was found at Myanaung, near the Irrawaddy River, but minor flows were unsustained. Deep drilling of shallow producing fields was under consideration. The Government failed to implement secondary recovery projects but increased exploration budgets. Burma Oil Corp.'s progress report series on oil activities was suspended after POI takeover.

The Mineral Industry of Mainland China

By K. P. Wang[1]

◆

MAINLAND China maintained its relative position as a significant world producer of mineral and related products in 1964. Its estimated mineral output value (mine output plus added value derived from smelting and processing) of somewhat less than $4 billion ranked the country just within the first 10 top mineral producing areas of the world. Although far behind Japan, the mainland China mineral output value exceeded the rest of the Far East countries put together. As in previous years, basic industries like coal, steel, cement, oil, and salt constituted the backbone of mineral enterpises.

In addition to the basic mineral commodities noted in the previous paragraph, many well-known export minerals and metals were produced. The country was one of the three foremost world producers of bituminous coal, anthracite coal, tin, tungsten, antimony, salt, and magnesite. It also ranked about fifth or better in the output of bismuth, manganese, mercury, molybdenite, asbestos, fluorspar, and graphite; about seventh in iron and steel; and about tenth in the major nonferrous metals, cement, barite, pyrite, and sulfur. Notable production deficiencies continued in chromite, nickel, copper, and phosphate rock as reflected by table 1, "World significance of selected Chinese minerals in 1963," in volume IV of the Minerals Yearbook 1963, p. 1280.

The most significant mineral developments in 1964 concerned petroleum. The claim that the country was "mainly self-sufficient" in oil[2] was repeated, as output obviously increased over the 1963 level in the light of statements proclaiming overfulfillment of production targets for both crude and refined oil. At the new Tach'ing field in the Anta area of Manchuria operations were expanded. Increased activity was also noted for Karamai in Sinkiang and Yumen in Kansu—the two other main crude oil centers. Shale oil facilities at Fushun were further mechanized. Mainland China's refining capacity was substantially enlarged, and much more drilling and refining equipment was produced.[3] The great shortage of pipelines prompted negotiations for purchase abroad. Contracts were made to buy additional foreign refinery equipment, including an Italian refinery and a Lurgi oil cracking plant from West Germany.

---

[1] Chief specialist, East Europe-Far East, Division of International Activities.

[2] China Reconstructs (Peiping). January 1965, p. 4.

[3] China Reconstructs (Peiping). November 1964, p. 33.

On October 16, mainland China exploded its first atomic bomb somewhere "in the Takla Makan Desert located beyond the Tien Shan Mountains which soar abruptly from the Soviet Kazakhstan steppes."[4] It appeared that domestically produced U–235 was used instead of plutonium, indicating possible existence of a gaseous diffusion plant.

In iron and steel, the effort was to raise capacity of existing facilities through improvement of operational indices and utilization coefficients; increase the variety of steel products particularly in rolled steel; continue construction of partially finished plants; investigate proven practices such as the LD (Linz Donawitz) converters; and relieve the shortage of sheet products like galvanized steel and tin plate through production and imports. Overall steel output increased possibly one-sixth over that of 1963.

The coal industry clearly moved ahead with stress placed on developing working reserves. The shaft sinking program continued. Mining productivity was raised through greater mechanization. Coal quality was further improved through better beneficiation. Many large coal mining enterprises showed production increases, and at least a dozen reported sizable new mines starting operations. The program to develop smaller mines in the south to meet local needs was implemented. Mainland China probably produced at least 7 percent more coal than in 1963.

Production of fertilizers received great emphasis. The highest claim on the output of chemical fertilizers was half again as much as 1963[5] so that the 1964 figure may be above 4 million metric tons. However, negotiations to import fertilizers indicated a continuing severe shortage. The Chinghsiang phosphate mine in Hupeh was probably completed and construction continued at the K'aiyang phosphate mine in Kweichow. Although few large cement plants were commissioned during the year, many small ones were opened; the net result was that cement output rose slightly, possibly 5 percent. The largest asbestos mine in Szechuan was in the process of expansion.

GOVERNMENT POLICIES AND PROGRAMS

Mainland China still had not announced its third 5-year plan (which might commence in 1966) after the lapse of the second one in 1962, probably on account of the debacle of the "Great Leap." Thus, industrial targets have not been revealed in recent years. Nevertheless, policies and programs subsequently pursued have brought about notable improvements in the economy and a greater industrial growth rate in 1964 than in 1963.

Continued stress was placed on development of mineral and industrial enterprises. Especially, the policy was to improve product quality, diversify products, streamline operations, and conserve materials. Improvements were made at many mines and plants, and the more promising of the smaller mines and plants were slated for expansion.

---

[4] Wall Street Journal (New York). Dec. 21, 1964, p. 1.
[5] China Reconstructs (Peiping). February 1965, pp. 32–34.

Investment and basic construction were at a greater pace than in 1963, although many were still mainly on projects already underway. Special attention was given to the development of metal fabrication facilities.

Much effort went into assisting agriculture. Production of chemical fertilizers and their raw materials was greatly expanded; imports of fertilizer materials remained at high levels; and foreign help in building fertilizer plants was sought. Steel production was partly geared to agricultural requirements, resulting in the manufacture of more agricultural tools and machinery.

Mainland China pursued an independent policy in mineral trade, still doing much business with the U.S.S.R. but trading more directly with other Communist as well as free world countries. Continued stress was given to the training of technicians from the ranks of workers. Since its establishment, the Peking Mining Institute has made university graduates out of about 1,200 "coal miners." In pursuing the program of building up a strong self-reliant industrial system, many mineral and industrial facilities of Chinese design were placed in operation during 1964. However, efforts were also made to procure advanced foreign technology.

PRODUCTION

Mineral output value rose by at least 10 percent over that of 1963. The 1964 level was more than any of the preceding 5 years, except for the exaggerated figures claimed for 1960. The mineral industry, with a strong mining base and reasonably good metallurgical sector, operated substantially in a conventional manner, having done away with most of the haphazard operations.

Coal and iron and steel were the main areas of mineral production, each accounting for more than one-third of the output value; oil, nonferrous metals, and cement together accounted for about one-fourth. However, output of some nonferrous metals represented significant shares of world totals.

The Chinese Communists have not reported any mineral output statistics for several years, having been particularly secretive about the lesser items. However, general trends are clear. Fertilizer and oil production made the most notable gains in 1964, followed by steel, coal, cement, and salt. Nonferrous base metals remained somewhat stationary, whereas output of at least some of the famous "export" metals may well have dropped because of the difficult marketing situation.

TABLE 1.—Mainland China: Production of metals and minerals[1]

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Bauxite [2]	350,000	400,000	400,000	400,000	400,000
Alumina	175,000	200,000	200,000	200,000	200,000
Metal, refined	80,000	100,000	100,000	100,000	100,000
Antimony, mine	15,000	15,000	15,000	15,000	15,000
Bismuth, mine	300	300	300	300	300
Copper:					
Mine	70,000	80,000	90,000	90,000	90,000
Metal, refined	100,000	100,000	100,000	100,000	100,000
Gold .... troy ounces	50,000	60,000	60,000	60,000	60,000
Iron and steel:					
Iron ore [3] .... thousand tons	55,000	35,000	30,000	35,000	37,000
Pig iron .... do	[4] 27,500	15,000	15,000	17,000	18,000
Steel ingot .... do	[4] 18,450	9,500	10,000	12,000	14,000
Rolled steel .... do	10,000	8,000	9,000	10,000	11,000
Lead:					
Mine	80,000	90,000	90,000	100,000	100,000
Metal, refined	70,000	85,000	85,000	90,000	100,000
Magnesium	1,000	1,000	1,000	1,000	1,000
Manganese ore .... thousand tons	1,200	800	800	1,000	1,000
Mercury .... 76-pound flask	23,000	26,000	26,000	26,000	26,000
Molybdenum, mine	1,500	1,500	1,500	1,500	1,500
Silver .... troy ounces	800,000	800,000	800,000	800,000	800,000
Tin, refined .... long tons	28,000	30,000	28,000	28,000	25,000
Tungsten concentrate, about 68 percent WO_3	20,000	20,000	20,000	20,000	18,000
Zinc:					
Mine	80,000	100,000	100,000	100,000	100,000
Metal, refined	70,000	90,000	90,000	90,000	90,000
Nonmetals:					
Asbestos	80,000	90,000	90,000	100,000	120,000
Barite	60,000	80,000	80,000	90,000	100,000
Cement .... thousand tons	[4] 13,500	8,000	8,000	10,000	10,500
Fluorspar	200,000	200,000	200,000	200,000	200,000
Graphite	40,000	40,000	40,000	40,000	40,000
Gypsum	600,000	400,000	400,000	500,000	600,000
Magnesite .... thousand tons	1,000	700	800	900	1,000
Phosphate rock	600,000	500,000	600,000	700,000	800,000
Pyrite .... thousand tons	1,000	1,000	1,100	1,200	1,300
Salt .... do	[4] 12,900	11,000	10,000	10,500	11,000
Sulfur	250,000	250,000	250,000	250,000	250,000
Talc	150,000	150,000	150,000	150,000	150,000
Mineral fuels:					
Coal .... thousand tons	[4] 420,000	250,000	250,000	270,000	290,000
Coke .... do	25,000	15,000	15,000	15,000	15,000
Petroleum:					
Crude .... do	[4] 5,500	6,200	6,800	7,500	8,500
Refinery products .... do	5,500	5,500	6,500	7,000	8,000

[1] Estimated except for a few claimed figures.

[2] Mostly diasporic bauxite. Data shown include only the bauxite for aluminum manufacture; in addition 100,000 to 200,000 tons were produced each year for making refractories.

[3] Converted to equivalent 50 percent Fe ore.

[4] Claimed figures. Coal, pig iron, and steel data appear to be grossly exaggerated by perhaps one-fifth or more.

TRADE

Overall trade volume of mainland China, never much of a trading country, showed no marked change in 1964. Minerals and metals remained significant in total trade, although occupying lesser positions than in 1963. Apparently oil imports declined, imports of fabricated metal products held steady, exports of traditional surplus minerals dropped somewhat, and exports of cement and asbestos increased. There were no published trade figures from mainland China, and data from countries trading with China were used. Accordingly, official trade statistics from the U.S.S.R., Japan, and Poland are presented to show trends. Political differences and near-completion of debt payment by mainland China brought about reduced Sino-Soviet mineral trade. Conversely, trade with Eastern Europe and Japan was rising.

According to broadcasts from mainland China early in 1964, that country furnished the Soviet Union with more than 1.4 billion rubles worth of mineral and metal products during 1949–62. Among the more important items mentioned were 100,000 metric tons of lithium concentrate, 34,000 tons of beryllium concentrate, 51,000 tons of borax, 270,000 tons of tungsten concentrate, 33 tons of piezoelectric quartz, about 224,000 flasks (7,730 tons) of mercury, 39 tons of tantalum-columbium concentrate, 7,000 tons of molybdenum concentrate, and 180,000 tons of tin. Soviet trade publications substantiate the above only in part, accounting for the bulk of the tin, about 50,000 tons of tungsten concentrate during 1960–62, and about 34,800 flasks (1,200 tons) of mercury during 1962.

TABLE 2.—Mainland China: Exports of selected metals and minerals to the U.S.S.R.

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:		
Antimony	---	2,000
Iron, pig	93,700	154,500
Lead:		
Concentrate	100	3,800
Lead	400	---
Mercury ... 76-pound flasks	34,810	11,603
Tin ... long tons	8,600	4,200
Tungsten concentrate	13,000	12,000
Nonmetals:		
Borax	6,400	6,900
Cement	689,000	373,000
Fluorspar	42,700	39,900
Salt	94,600	103,400
Sulfur	20,100	20,200
Talc	57,700	40,300
Mineral fuels:		
Bituminous coal	201,000	205,000

Source: Official trade returns of the U.S.S.R.

TABLE 3.—Mainland China: Imports of selected metals and minerals from the U.S.S.R.

(Metric tons)

Commodity	1962	1963
Metals:		
Aluminum:		
Ingot	1,375	1,500
Rolled	288	81
Cobalt	---	15
Copper, rolled	245	142
Ferroalloys	2,000	1,000
Iron and steel semimanufactures	95,200	88,900
Nickel:		
Ingot	1,020	1,000
Rolled	57	141
Mineral fuels:		
Petroleum refinery products:		
Gasoline	764,700	455,400
Kerosine	488,300	476,000
Diesel fuel	378,400	333,200
Lubricants	210,200	134,700
Greases	3,200	3,300
Paraffin	2,500	2,400

Source: Official trade returns of the U.S.S.R.

TABLE 4.—Mainland China: Exports of selected metals and minerals to Japan

(Metric tons unless otherwise specified)

Commodity	1962	1963
Metals:		
Antimony:		
Ore and concentrate	712	634
Sulfide	130	NA
Iron and steel:		
Iron ore	-----	22,848
Pig iron	19,678	80,271
Manganese ore	10,154	9,436
Silver thousand troy ounces	318	-----
Tin long tons	820	1,174
Tungsten concentrate	56	158
Nonmetals:		
Alumina shale	1,960	510
Asbestos	-----	41
Barite	1,792	2,210
Feldspar	397	1,103
Fluorspar	26,518	51,415
Magnesia clinker	5,041	1,514
Quartz and quartzite	305	540
Salt	309,788	439,263
Steatite (soapstone)	5,000	4,944
Talc	2,126	3,335
Mineral fuels:		
Coal:		
Anthracite	16,505	26,337
Coking bituminous	157,875	67,426

NA Not available.

Source: Official trade returns of Japan.

TABLE 5.—Mainland China: Exports of selected metals and minerals to Poland

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963
Metals:				
Antimony	1,250	2,402	1,000	NA
Bismuth	31	-----	-----	-----
Iron ore	131,000	35,700	13,300	-----
Manganese peroxide	NA	500	900	100
Mercury 76-pound flasks	1,015	1,015	812	928
Molybdenum concentrate	-----	-----	241	238
Tin long tons	148	710	226	199
Tungsten concentrate	-----	-----	3,400	2,402
Nonmetals:				
Asbestos	831	2,326	4,383	1,077
Barite	4,191	5,612	7,737	4,990
Fluorspar	13,300	10,200	14,300	11,200
Magnesite	24,000	7,000	11,300	15,300
Sulfur	13,000	11,000	20,000	22,000
Talc	5,000	2,000	700	1,200

NA Not available.

Source: Official trade returns of Poland.

COMMODITY REVIEW

METALS

Iron and Steel.—The steel industry continued to make good progress. Although still much lower than the exaggerated claim of 1960, output was much higher than in 1963. Possibly 13 million metric tons of the total steel production came from so-called modern enterprises, which were operating at close to optimum levels.[6] Measures were taken to improve operational efficiency of existing blast, open-hearth, and electric furnaces, with not too much done on constructing new smelting units. A definite interest was shown in introducing Austrian top-blown oxygen converters. With regard to steel fabrication, however, a number of additional facilities came into being, some as part of the long-term program in the development of integrated steel bases.

---

[6] For details on capacity by producing centers, see Minerals Yearbook 1963, vol. IV, table 6, p. 1286.

Vastly improved operational indices were claimed for the steel industry.[7] Comparing data for the first 8 months of 1964 with data for all of 1963, coke consumption per metric ton of pig iron declined by "several tens of kilograms," blast furnace utilization coefficient increased 17.5 percent, and open-hearth furnace utilization coefficient increased 6.5 percent.

The Chinese Communists claim successful trial production of more than 400 new types of steel and rolled steel including many stainless and other alloy steels. "Already in mass production are complex stainless steel plates for nitrogenous fertilizer manufacturing equipment, high-pressure and hydrogen-resistant steel tubing for oil pipes, thick channel beams for new-model tractor, shaped steel plates for heavy-duty trucks . . ., ultra high-pressure seamless tubes . . . Prior to the liberation, almost all rolled steel had to be imported. By contrast, China became 75 percent self-sufficient in rolled steel by 1957. Today the proportion is over 95 percent."[8]

Nonetheless, the need to import some special steel products remained acute. Small amounts of pig iron have long been traded with the Soviet Union and other Communist countries for finished products. Western Europe furnished sizable quantities of special steels. At yearend Japan and mainland China signed the following contract for 1965; Japan will ship 18,820 tons of strip sheet, 8,164 tons of galvanized iron, 17,500 tons of tin plate, and 22,595 tons of steel pipe, among other things; and mainland China will ship 50,000 tons of iron ore and 500,000 tons of coking coal (which may be upped another 200,000 tons). Japan also contracted to buy 526,000 metric tons of pig iron for April 1964–March 1965.

Much attention was given to iron ore extraction, beneficiation, and transport. Within the Anshan complex, expansion of four iron and magnesite open-pit operations, including Ta-ku-shan, was presumably completed and new shafts were built for mining high-grade ore. The new open-cut mine at Penhsi (Pench'i), Liaoning, started to yield ore after removal of overburden. Construction of a 5.4-million-ton mine-run iron ore beneficiation plant at Maanshan moved ahead. The Hsiangpishan open pit near Tayeh was enlarged to meet the needs of the Wuhan complex. Iron beneficiation facilities were being expanded at Wuhan and Paotou.

Anshan, the leading steel base, probably topped 5 million metric tons in steel products output. Movement towards greater mechanization and employment of more highly-trained technical personnel continued. The Chinese claimed that by December 23, 1964, Anshan's production was already 151,000 tons more than the 1964 plan for steel and 177,000 tons more than the plan for steel products.[9] At yearend, the 918-cubic-meter No. 7 blast furnace, after being reconstructed to accommodate more intensified smelting, boosted daily output by 200 tons while reducing coke consumption per ton of pig iron by 16 kilograms. In 7⅔ years of operation, until April 1964, the 944-cubic-meter No. 9 blast furnace had produced 4 million tons of pig iron. The 1,513-cubic-meter No. 10 blast furnace went through the year without mishap. In mid-1964, Anshan's blast furnaces were reportedly producing an average of 1.6 tons (maximum 1.8 tons) per cubic meter of furnace volume per day and consuming 540 kilograms of coke per ton of pig iron. The Nos. 6, 12, and 17 open-hearth furnaces were singled out as best performers in this category. More than half of the open-hearth furnaces ran through 500 heats with magnesia-alumina refractories, headed by the 804-heat record by the No. 6 furnace. Use of blast furnace slag to make tiles was initiated. By yearend Anshan's 10 blast furnaces and 25 open-hearth furnaces were capable of producing nearly 20,000 tons of pig iron and steel daily.

---

[7] Jen-min Jih-pao (People's Daily; Peiping), Sept. 24, 1964, pp. 1–2.
[8] China Reconstructs (Peiping). January 1965, p. 3.

At the end of 1964, the 3-million-ton new steel center at Wuhan was still operating at not much more than half capacity. There was no information that another blast furnace has been added to the two in existence (1,386 and 1,436 cubic meters). However, some construction of steel furnaces and rolling mills probably took place and overall production of steel products was somewhat higher than in 1963. It was claimed that output targets for the first half of 1964 were fulfilled.

The Paotou steel center, also scheduled for a 3-million-ton production, may have been about half completed as of 1964. Integrated operations oriented around a 1,513-cubic-meter blast furnace provided the main output. Construction had begun on a second blast furnace of similar size a few years back, but the completion of this furnace has not yet been reported. A large ore concentrator was being constructed.

The Shanghai steel industry increased output somewhat over that of 1963, in line with greater local industrial activity. More of the available capacity was utilized. Of the roughly 10 plants of different kinds in existence, several reported a rise in production. Emphasis was on making new products. A galvanizing plant was placed in operation at the Shanghai No. 3 Plant late in 1964,[10] and a tinplate line for strips was installed at the Shanghai No. 10 Steelworks.[11]

The Shihchingshan-Tangshan-Tientsin-Peiping complex, with an annual capacity of 1 million to 1.5 million tons, appeared to have had a good year. Taiyuan has been built into a sizable industrial center. Its steelworks were described as large and integrated, producing more than 300 different products including rolled sheets and cold castings;[12] it is likely that annual steel capacity here is greater than the one-half million tons previously credited. A coke byproduct fertilizer plant was completed at the Taiyuan Steelworks late in the year.

---

[9] Jen-min Jih-pao (People's Daily; Peiping). Dec. 26, 1964, p. 1–2.
[10] Kung-jen Jih-pao (Workers Daily: Peiping). Nov. 29, 1964, p. 1.
[11] China Pictorial. Peiping. June 1964, p. 43.
[12] China Reconstructs (Peiping). May 1964, p. 37.

The Chungking Steelworks underwent expansion, particularly in terms of diversification of products; more efficient operations and increased output were also claimed.

Other Metals.—The Chinese Communists maintained secrecy on their "colored" metals. However, fragmentary information on trade and developments indicated that nonferrous base metals had a reasonably good year whereas the so-called "export metals" probably did not fare so well because of marketing difficulties. Considerable gains, however, were claimed for nonferrous metals in general and new mining as well as metallurgical projects were reportedly under construction for manganese, magnesite, copper, lead, zinc, aluminum, and tin.

Sufficient manganese ore was produced for domestic steelmaking with a small surplus available for export. A large open-cut manganese mine has been developed in Hsiangt'an, Hunan. The chromite shortage was met by imports and substitution. Albania has been providing 30,000 to 50,000 tons of chromite annually to mainland China, with North Viet-Nam and the United Kingdom as lesser sources. Magnesia-alumina brick was being substituted for refractory chromite. The nickel shortage also was severe, and some imports probably came from the U.S.S.R. and Cuba. The Chinese Communist steel industry consumed very little of the tungsten and molybdenum produced in the country. Overtures were made to the Japanese for the sale of molybdenite.

With regard to nonferrous base metals and light metals, copper continued to be the only item in short supply. Chile reportedly sold 5,000 tons of refined copper to mainland China for delivery in 1965, an amount roughly equal to 5 percent of Chinese Communist production. Some copper also was bought from Rhodesia and Europe. No detailed information was available on the development of new porphyry copper-molybdenum deposits. Zinc production appeared sufficient for domestic needs, and there was some surplus of lead concentrate. The heart of the mainland China aluminum industry was still the Fushun plant in Manchuria. However, the Chinese Communists showed interest in getting European and Japanese help in expanding aluminum facilities.

Hardly any operational information was available on the famous "export metals" during 1964. Trade developments in 1963 were generally known; apparently lesser quantities of such metals entered world trade in 1964. Tin output appeared to have declined, possibly to 25,000 tons. The trend towards greater tin exports to the free world and Eastern Europe at the expense of Soviet Union was clearly shown in 1962–63. Tungsten production also dropped slightly to perhaps 18,000 tons, with the Soviet Union still the main importer followed by Poland. Antimony production may have held steady in 1964; importing countries headed by West Germany, the U.S.S.R., and France accounted for 9,000 tons of antimony from mainland China during 1963. Mercury from mainland China has had a world impact, with about 34,800 flasks (1,200 tons) being exported to the Soviet Union in 1962 and at least 650 tons being exported to all sources in 1963. The Chinese Communists have been shipping most of their surplus molybdenum concentrates to the Soviet Union. Bismuth from mainland China was another well-known product in European markets. Mainland China needed rutile and pigments from abroad; it imported rutile from Australia amounting to about 3,000 tons in 1963 and 2,000 tons in the first half of 1964.

NONMETALS

Asbestos.—Asbestos production increased considerably mainly as a result of an expansion program taking place at Shihmen, Szechuan, the principal asbestos area. Four of ten new projects had been completed in late 1963 and several more undoubtedly were finished in 1964. Most asbestos was used domestically, but there was a growing market abroad.

Boron.—An extensive boron mineral resource is located at Iksaydam Lake, north of the Charkhan potash deposit. There are other "boron" lakes in the district. A borax plant was built in the area of Iksaydam Lake (which covers 40 to 45 square kilometers) in 1958; hundreds of furnaces were reportedly in operation in the early sixties. Borax was an export chemical and this deposit illustrates mainland China's potential.

Cement.—Although substantial gains in output were claimed for "building materials" in general, no such claims were made for cement. The emphasis was on improving operations and product quality, construction of a few plants, making more cement products, and promoting exports. The Chinese Communists did say that "in the past 15 years cement production increased 15 times,"[13] placing the 1964 production at above 10 million tons, a figure in line with the estimated aggregate of individual plants.[14] Small plants contributed 15 to 20 percent of the total cement output. Demand for cement rose somewhat and exports, mainly from Manchuria to the Soviet Far East and from southern mainland China to Hong Kong, remained at nearly 1 million tons. Whereas some areas mentioned above had cement surpluses, others such as northern mainland China had shortages. Approximate receipts of cement by importing countries or areas during 1963 in thousands of metric tons were as follows: U.S.S.R.—373 (689 in 1962); Hong Kong—437 (267 in 1962 and 498 in 1964); Malaysia—105 (60 in 1962); Pakistan—80; Ceylon—39; and Cambodia—12.

Nearly half of the approximately 50 large and medium cement plants (100,000-ton to million-ton annual capacity) were mentioned in the Chinese Communist press during 1963–64, and it was claimed that more than 10 large plants (200,000-ton size or larger) and some 80 small plants (less than 100,000-ton size) had been built in the last few years. For example, Liuliho in the Pieping area was producing in excess of 1,500 tons of cement per day at the beginning of 1964. Chungking was operating at close to capacity of one half million tons plus. Kwangchow had a good year in 1964, with its new 125-foot No. 4 kiln designed and built by mainland China. The 2-kiln Liuchow plant in Kwangsi, built with Czechoslovak help, was presumably completed. The Chungkuo plant in Nanking ran its No. 3 kiln nearly a year without stoppage. Kiangnan was said to be the only plant making oil well cement. Mutanchiang in Kirin passed through the trial stage and has become an efficient operation. A new belt conveyor system was installed at the Dairen plant in Liaoning. A 300,000-ton cement plant was under construction in Inner Mongolia. The No. 2 large kiln of the Kweiyang plant in Kweichow had operated continuously for 130 days by March 20, 1964. New operations were mentioned for Sinkiang and Lhasa in Tibet. The Wuhan, Ocheng, and Yich'ang plants in Hupeh Province were being remodeled and expanded for an additional combined 100,000 plus tons of cement per annum.

---

[13] CNS (China News Service). Feb. 21, 1965.

[14] For details on cement output and capacity by plants, see Minerals Yearbook 1963, volume IV, table 7, p. 1290.

The vertical kilns of Kwangtung Province were illustrative of the many small cement operations in the country. Early in 1964, there were 19 such kilns in Kwangtung (including 6 semimechanized ones) which together produced 208,000 metric tons of medium-grade cement in 1963.[15] Reportedly, these kilns were cheap and fast to build, were easy to operate, and could use low-quality coal for firing. For these reasons the kilns were suitable for conditions in Kwangtung.

Development and expansion of mines and quarries for cement production continued. The K'ungshan limestone quarry was being expanded and mechanized to meet the growing needs of the Chungkuo and Kiangnan cement plants in Kiangsu. The Huangchinshan limestone mine in Hupeh was being developed for the Huahsin cement plant. The Fushun cement plant in Manchuria continued to use byproduct oil shale as a raw material. Most established cement plants strengthened their raw material base. Gypsum has never been a problem; indigenous mines provided the 300,000 to 400,000 tons of gypsum consumed in cement manufacture in 1964.

Fertilizer and Chemical Materials.—To cope with the food problem for a growing population, continued stress was placed on developing fertilizers and chemical raw materials. Pyrite and phosphate production was given high priority. Many pyrite mines were being developed, and an important discovery of high-grade ore was announced (location unknown). The Hsiangshan pyrite mine in Anhwei Province, rated initially at 400,000 tons per annum and of Chinese design, went through its first year of full-scale operations. The Yingte mine in Kwanktung Province, designed for about 300,000 tons of pyrite per year, probably was substantially completed by yearend. Although the pyrite from most of the mines went into sulfuric acid and fertilizers, a considerable portion mined in Szechuan and Shansi was converted to sulfur.

Increasing demand for phosphate rock prompted large imports from Morocco (288,000 tons in the first half year of 1964). Some apatite also came from North Viet-Nam. Several large domestic mines were being developed to relieve the shortage. The 600,000 ton-per-year (first stage capacity) Chinghsiang phosphate rock mine in Hupeh Province presumably was completed. A large phosphate rock mine also was under development at K'aiyang in Kweichow Province. The Chinese Communists claim an annual capacity of more than 2 million tons of phosphatic fertilizers.[16] Seven large plants headed by Nanking have a combined capacity of about 1 million tons of phosphates, with nearly a hundred small plants scattered around the country accounting for the rest.

---

[15] Kung-jen Jih-pao (Workers Daily; Peiping). Apr. 23, 1964, p. 2.
[16] Jen-min Jih-pao (People's Daily; Peiping). Aug. 5, 1964, p. 2.

Chemical fertilizer production in mainland China increased considerably, possibly by as much as 50 percent over that of 1963, but imports remained at a relatively high level, and a contract with Japan late in 1964 called for 1.1 million tons of chemical fertilizers from that country in 1965. The overall supply of 5- to 6-million tons of all fertilizers (phosphatic, nitrogenous, and potassic) in 1964 continued to be far short of the potential demand which easily exceeds 20 million tons annually. Seven major nitrogenous fertilizer projects were either completed or in the final stages of construction. Of the nearly 1.8 million tons of "large plant" capacity for nitrogenous fertilizers, more than half can be credited to the Dairen, Nanking, and Kirin plants. Wuching in Shanghai is a new urea plant. The short-term shortage of sulfides and phosphates prompted the building of ammonia-type plants. In this connection, many small plants recently built are producing ammonium bicarbonate; such plants, while producing inferior-grade fertilizers, are claimed to be workable on a local scale.

A number of European built fertilizer plants have been contracted for delivery during 1965–66. A $8.4 million ammonia plant (probably 100,000 tons) was ordered from Humphreys and Glasgow, Ltd., of the United Kingdom, for Luchow, 115 miles up the river from Chungking, Szechuan. A complementary $7 million urea fertilizer plant (175,000 tons) was also ordered for Luchow from the Netherlands firm Continental Engineering (part of Stork-Werkspoor). At least one $7.5 million "fertilizer" plant (150,000 tons) for an unreported location will be supplied by the Italian firm, Montecatini.

Although pyrite was the main sulfur-bearing raw material utilized in making sulfuric acid and fertilizer in mainland China, elemental sulfur was vital in other uses. During 1964, about half of the roughly 250,000 tons of sulfur produced came from pyrite and the other half was derived from 20-percent sulfur ores. The country has had surplus sulfur, but the quantity exported, mainly to the Soviet Union and Poland, has declined somewhat in recent years.

A multibillion-ton deposit of potash (carnallite), discovered about 1957 in the subsurface lake of Charkhan (Tsaidam Basin Tsinghai), may place China on the potash map. The carnallite horizon, under very shallow overburden of salt and brine, may average 15 meters in thickness and covers more than hundreds of square kilometers. A potash mill of "tens of thousands of tons" was built in 1958 near the lake.

Magnesite.—Manchurian magnesite continued to be of great world significance, and output probably rose to a level rougly equal to the peak achieved in 1960. Additional magnesia-making capacity was added at Anshan and elsewhere so as to produce more magnesia-alumina refractory bricks for iron and steel smelting. Small quantities of magnesite and magnesia were exported.

Salt.—Mainland China retained its position as the world's second largest producer of salt; most of the salt was consumed for food purposes, but because industrial demand was increasing, the main objective of the producers was to produce a better grade of salt, rather than to increase output. This was clearly achieved in most of the salt fields: For the 11 leading sea-salt producing provinces, roughly two-thirds of the salt was claimed to be premium or number 1 grades.

Actually, for most of the northerly salt fields, including the country's largest—Ch'anglu in Hopeh and Yingkai in Liaoning—the spring season was good, but wet weather followed, so that a monumental effort was needed to maintain quality and to achieve production targets. Mainland China had a small surplus of salt; possibly half a million tons out of about 11 million tons produced were exported, primarily to Japan and to the Soviet Union.

The Tzuliuching salt wells near the oil and gas fields in inland Szechuan Province, which provided about one-tenth of the total salt output, installed rinsing and filtering facilities to separate byproducts as well as 10,000 meters of pipings to transport salt solutions for cleaner extraction. Mention was made in 1964 of the very extensive salt resources of Sinkiang, comprising lake salt, rock salt, and dune salt totaling billions of tons. Output was not large in 1964, but Sinkiang lake salt is most famous for its high purity.[17]

Other Nonmetals.—Barite production presumably increased considerably to meet the needs of oil drilling and to provide a surplus for export. Fluorite output from Chekiang and north China remained steady; about half was exported, and the balance was domestically consumed. In 1963, reported fluorite exports by mainland China amounted to nearly 110,000 metric tons, mostly to Japan and the U.S.S.R. Nearly half of the high-grade steatite talc from Taling, Liaoning was exported. Polished marble slabs became a new nonmetal export product.

MINERAL FUELS

Coal.—The coal industry continued its development along conventional lines, having done away with most of the inefficient operations created in haste during the "Great Leap." The Chinese Communists claimed that 67 pairs of new coal shafts were under construction at the end of 1963, mostly in the low-level coal production areas of eastern, central-south, and northwest China. In addition, about 60 pairs of shafts reportedly were being extended at established coal mining centers. Thus, 30 million to 50 million tons of annual coal capacity was being developed in 1964. For the best known mines alone, the additional coal capacity completed during the year totaled more than 10 million tons.

Coal production was at least 20 million tons higher than in 1963. Thirty-three coal mining administrations provided about two-thirds of the coal. The seven big coal mining centers (Fushun, Fushin, Kailan, Huainan, Chihsi, Hokang, and Tatung, roughly in descending order) each produced 10 million to 20 million tons and together they produced approximately 100 million tons. A dozen mines were in the 2- to 9-million-ton range, and many others were in the 1- to 2-million-ton range. Of the 290 million tons estimated to have been produced in 1964, the bulk was bituminous coal with only about 20 million tons as anthracite. Hydraulic mining may have contributed 20 million to 25 million tons of the output.

Many specific developments were reported for the various coal centers. The large Laohut'ai shaft mine of Fushun went through its first year of full-scale production; the Fushun enterprise, famous for open-pit operations and employing 2,200 engineers and technicans, was starting to mine more coal underground. At yearend, a 600,000-ton shaft mine was commissioned at Fushin, another well-known stripping operation. A new vertical shaft mine of 1.8 million tons capacity designed and built entirely by the Chinese, commenced operations at Fankochuang in October 1964. At Huainan, the 900,000-ton underground K'unghsi mine was under construction in mid-1964. At Tatung, the first stage expansion of the 1.5-million-ton inclined shaft mine of Yungtingchuang was completed in March. The 600,000-ton Changhsin vertical shaft mine of Chihsi, Heilungkiang, started production about midyear. The new 750,000-ton Tahu mine in the Hopi field, Honan, started operations in March. The Chinghsi anthracite field near Peiping and the Shihchichieh mine in Shansi were among the many mines reporting successful operations during the year. Coking coals from Chunghsing, Shantung, and Fengfeng, Hopeh, were contracted for shipment to Japan.

---

[17] Ta-kung-pao (Peiping). Aug. 13, 1964, p. 2.

Detailed information about one of the new coal bases, P'ingtingshan in Honan, was revealed.[18] The No. 10 shaft mine of this coal base of 1.2-million-ton annual capacity started production in February, raising the overall capacity of the enterprise to more than 6 million tons. The other nine mines, of varying size, are all smaller. Most of the coal is coking coal, which was sent almost entirely to the Wuhan iron and steel center receiving about 20 million tons since 1958. P'ingtingshan has become an industrial city of "several hundreds of thousands of people."

Much was accomplished in improving coal quality and extraction indices. Large coal beneficiation capacities have been developed in recent years and most coal bases, particularly the new shafts and pits, have such facilities. During 1963-64, the average ash content for ordinary coals and coking coals was lowered by more than 2 and 1 percent, respectively. Better coal quality has been achieved not at the expense of, but along with greater production. Comparing the first quarter of 1964 with the last quarter of 1963 for the large mines directly under the Ministry of Coal, the Chinese Communists claimed increases in output of 8.3 percent and mine development footage by 7.2 percent.[19] For the first 8 months of 1964, productivity reportedly topped the previous year by 13.4 percent.[20] Underground rock tunneling made a most significant advance. Rock tunneling for all large coal mines in mainland China was said to be proceeding 30 percent faster in the period from July 1, 1963 to June 30, 1964, than in the preceding period.[21] This had an important effect on development of reserves for future expanded production. To conserve timber in coal mining, the use of retrievable steel props was increased.

Petroleum.—The oil industry continued to make significant gains by producing greater quantities and varieties of products. Much activity was reported in field development and refining. Separate statements credited to Chou En-lai indicate that oil output was 20 percent higher than in 1963, and that output was expected to reach 10 million tons in 1965. The 1964 targets for crude oil and oil products were reportedly overfulfilled and capital construction was greater than in any previous year. A conservative estimate of crude oil production for 1964 would be about 8.5 million tons, slightly higher than refinery output. Much effort went into the expansion of refinery capacity, particularly for processing crude from central Manchuria. To facilitate oil distribution, domestic and imported pipelines were in great demand to complement oil distribution by tankers. The industry was seeking means to achieve temporary stabilization.

---

[18] China Reconstructs (Peiping), October 1964, pp. 10–12.
[19] Kung-jen Jih-pao (Workers Daily, Peiping). Apr. 30, 1964, p. 1.
[20] Kung-jen, Jih-pao (Workers Daily, Peiping). Oct. 8, 1964, p. 2.
[21] Kung-jen Jih-pao (Workers Daily, Peiping). July 19, 1964, p. 1.

Additional production altered the overall supply position. Reduced imports from the Soviet Union initially may have been brought about for political reasons, but import requirements have declined as domestic production has increased to currently claimed levels of near self-sufficiency. Crude oil imports, mainly from Albania, were small, and imports of refined oil, principally from the Soviet Union and secondarily from Rumania, probably declined to the lowest level in years. Offers to sell crude to Japan were reported, very likely as a temporary measure, while awaiting developments of additional refinery capacity. A 10-percent greater distribution of oil products to the civilian economy during 1964 as compared with 1963 was reported, coupled with announcements regarding sizable reductions in refinery product prices, showing the optimism of the Chinese Communists over their prospects for oil.

Tach'ing, Yumen, and Karamai were the country's three leading oil producing basins. The most important aspect of oil development concerned the Tach'ing (also called Sungliao, Anta, and Shaertu) fields near Anta north of the Harbin-Tsitsihar Railroad in Manchuria. These fields, discovered in 1959, have been developed energetically. Specific production data have not been reported, but much drilling and development took place; there were indications that it was difficult to dispose of the sizable amounts of crude oil produced. Estimated 1964 output was rising and was more than 2 million tons. The Chinese Communist press described this field of 40,000 workers several times in 1964 without giving much technical detail except for drilling problems in cold weather. Large shipments of crude in rail tankers were made to unreported destinations. Although plans for a refiinery were not reported, this would be a logical development.

Construction of 15 projects in progress during 1963 at the Karamai oilfields continued; trucks with several tank trailers were used for haulage. The 1964 crude oil target of the Yumen oilfields was achieved 17 days ahead of schedule.[22] Expansion of the Szechuan gasfields continued, as more gas was piped to various industries. A scrubbing facility connected with urea manufacture was installed at the large Lanchow refinery.[23] The Shanghai refinery's thermal cracking plant was greatly enlarged in capacity by replacing four towers with much larger ones.[24]

At the Fushun shale oil center in Manchuria, which produced about 2 million tons of refined petroleum during 1964, the old No. 1

---

[22] Jen-min Jih-pao (People's Daily; Peiping). Dec. 26, 1964, p. 2.
[23] Jen-min Jih-pao (People's Daily; Peiping). July 19, 1964, p. 2.
[24] China Reconstructs (Peiping). November 1964, p. 33.

Refinery was modernized.[25] By renovating and automating the low-pressure recovery system (that follows the retorting of the crude) and the cracking unit for better recovery of waste heat, capacities were raised one-fourth or more, the working force was reduced by one-fifth, and operating costs were lowered. There was much traffic in oil at Fushun, indicating the possibility that some of the Tach'ing crude was processed here. The new Maoming shale oil center in Kwangtung, designed for more than 1-million-ton refined oil capacity per year, "was basically completed in 1962 but has been constantly under expansion." [26]

Much drilling equipment as well as many rail, truck, and river tankers were produced, but the most important development was in the output of refinery equipment, which for the first half of 1964 was claimed to be equal to the entire output for 1963.[27] The equipment produced included coke chambers for thermal cracking of residuum into light oils and petroleum coke and "7-story high vacuum towers." The need for refining equipment was so great that foreign refineries and equipment also were contracted. Orders were placed with the West German firm, Lurgi Gesellschaft, for a $12.5 million oil cracking and olefine separation plant to be delivered in 1965, and orders were also placed with the Italian firm, Sham-Projetti, for a $9 million refinery to be delivered in 1966. France, the United Kingdom, and Japan also were approached on selling mainland China oil plant equipment.

---

[25] Jen-min Jih-pao (People's Daily; Peiping). Nov. 6, 1964, p. 2.
[26] Hsin Wan Pao (New Evening Paper; Hong Kong). Apr. 14, 1964, p. 1.
[27] China Reconstructs (Peiping). November 1964, p. 33.

The Mineral Industry of Indonesia

By J. M. West[1]

⁂

MINE tin and crude petroleum output were Indonesia's main contributions to world mineral supplies in 1964, accounting respectively for about 8.5 percent and nearly 2 percent of world totals. The nation was foremost among Far East countries in petroleum production ranking third in tin output behind Malaysia and mainland China, and ahead of Thailand. It ranked fifth among all countries in tin production, one place better than in 1963 when surpassed by Thailand. With West European assistance and high tin prices tin mining appeared on the way to recovery. A modern tin smelter was scheduled to begin operation at Muntok, Bangka Island, in 1965 or 1966.

Total mineral production was valued at an estimated $450 million in 1964; of this, petroleum contributed about four-fifths and tin one-eighth. Cement, salt, coal, and bauxite comprised most of the balance.

Indonesia received assistance from many countries in developing its minerals and processing infrastructure. The Netherlands Government promised $27.8 million in export credit insurance for 1965 Dutch exports to Indonesia, which include mining machinery. The Federal Republic of Germany offered credit guarantees for an iron-producing blast furnace at Lampung and for tin-dredging equipment. Two large seagoing tin dredges were under construction in Scotland, backed by British credits. Japan was financing several hydroelectric projects under war reparations and a 150,000-kilowatt thermal powerplant, planned for Tandung Priok, Djakarta. Construction was underway on the Soviet-financed Tjilegon steel plant, West Java. Projects proposed or in progress with assistance from Communist countries included coal mine development, cement plants, a phosphate fertilizer plant, an aluminum refinery, and possibly another steel mill. East and West Germany were supplying railroad equipment, and Italy's Consinalit S.P.A. signed to build a $56.1 million petrochemical project under a 9-year credit arrangement. U.S. companies were active primarily in oil production and exploration.

---

[1] Physical scientist, Division of International Activities.

GOVERNMENT POLICIES AND PROGRAMS

All major Indonesian mineral deposits were owned by the Government and exploited by Government production agencies or by private parties through negotiation with the Government. Foreign interests participated in mineral development through production sharing, which generally requires an advance of equipment and technical skills in return for a promise of repayment from project profits. Petroleum operations remained the only important segment of the mineral industry not under full Government control, but takeover procedures were underway, raising questions concerning eventual payments for confiscated properties. At the same time, the Government was interested in obtaining new investments by foreign oil interests.

PRODUCTION

Crude petroleum, Indonesia's chief export product, showed gains in 1964, with output 5 percent more than that of the previous year, but estimates for refinery products were lower, reflecting plant maintenance and labor problems. Tin production rose from a depressed low in 1963 that was caused chiefly by equipment failure. Output, though seemingly on the way to recovery, was still less than half the recorded high of 35,861 long tons of tin-in-concentrates produced in 1954. The 1963 low coincided with the Malaysian confrontation, which brought about a shift in concentrate shipments from Penang and Singapore to the Netherlands. It was reported that poor price distribution practices in tin mining areas also affected production. Higher tin prices encouraged smuggling, and it was speculated that actual output might have been as much as 10 percent more than that officially reported.

Along with higher tin and petroleum outputs, production of bauxite made a significant gain and was expected to make further increases in 1965. A precipitous drop in coal production accompanied administrative difficulties. Cement output was probably somewhat lower and was trailing demand, as indicated by a thriving black market in cement. Construction of new facilities was delayed by diversion of funds and equipment shortages. Tin refining continued on a small scale at one plant but was expected to increase in 1965–66 with the advent of a new smelter.

TABLE 1.—Indonesia: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Bauxite	395,678	419,856	^{r} 491,298	493,111	^{r} 647,805
Gold [1] troy ounces	^{r} 5,660	5,337	4,469	4,437	^{r} ^{e} 6,400
Lead	---	---	---	---	650
Manganese ore	10,910	12,707	4,953	^{r} 2,841	^{e} 500
Monazite sand	NA	101	139	153	140
Nickel ore	13,758	18,000	12,722	45,705	47,950
Silver thousand troy ounces	311	324	248	280	^{e} 290
Tin:					
Concentrate, metal content long tons	22,596	18,574	^{r} 17,587	^{r} 12,927	16,345
Metal do	1,977	^{e} 2,000	^{e} 2,000	^{e} 2,000	^{e} 1,800
Nonmetals:					
Asbestos	NA	436	32	70	---
Asphalt rock	1,936	5,590	6,053	^{r} 10,489	5,315
Cement thousand tons	387	^{r} 445	511	^{r} ^{e} 511	^{r} 439
Iodine (content of cupreous iodide) kilograms	3,594	3,144	4,373	NA	NA
Phosphate rock	6,870	9,882	5,796	^{r} 1,125	^{r} 3,408
Salt:					
Government (reported) thousand tons	219	447	304	NA	NA
Private (estimated) do	150	250	240	NA	NA
Total do	369	697	544	NA	NA
Sulfur	500	817	932	1,050	^{e} 1,000
Mineral fuels:					
Coal	657,164	563,530	470,703	591,356	446,213
Petroleum:					
Crude thousand 42-gallon barrels	152,988	155,369	167,771	162,500	170,700
Refinery products [2] do	86,700	79,840	^{e} 80,000	^{e} 75,000	^{e} 70,000
Natural gas million cubic feet	90,725	95,577	^{r} 100,988	^{r} ^{e} 103,222	^{e} 110,000

^{e} Estimate. NA Not available. ^{r} Revised.

[1] Officially reported Indonesian statistics representing government output; private production by small unorganized producers may be as much as 30,000 troy ounces per year.

[2] Breakdown reported for 1961, in thousand barrels, as follows: Gasoline 18,215, Kerosine 14,766, Distillate fuel oil 18,883, residual fuel oil 26,168, and other 1,810.

TRADE

Indonesia continued to export most of its mineral products. The principal items in foreign trade were petroleum and tin. Petroleum exports in 1963 were valued at $269 million compared with $245 million for rubber, which had been the leading export commodity, and comprised nearly 40 percent of the value of all exports. The value of petroleum exports in 1964 was expected to be about 5 percent higher than in 1963. Main recipients of Indonesian oil in 1963 were Japan, Australia, Malaysia, the United States, and the Philippines. Malaysia was dropped from the trade list in 1964, whereas, based on half-year data, shipments to the Philippines and Japan were increasing while those to the United States and Australia were decreasing.

Tin concentrate production increased and was exported exclusively to the Netherlands, which recorded imports from Indonesia in 1964 of 19,538 long tons, compared with only 952 long tons in 1963. Malaysian confrontation was responsible for the change. Other minerals including bauxite, nickel, and manganese ores were exported to Japan. Earnings from tin shipments dropped to $19 million in 1963 compared with $35 million in 1962 but rose again in 1964.

Trade in general was chaotic because of fluctuating foreign exchange rates and complex regulations. A new law passed in 1964 based the amount of foreign exchange to be turned over to the Government from export transactions on official price lists published monthly. Exporters were permitted under this law to retain any surplus earnings as "complementary foreign exchange." There were serious problems in financing imports. Barter arrangements were being made with Japan for exchange of Indonesian bauxite for rolled steel, and aluminum metal imports from Japan were increasing. About 630,000 tons of Bintan bauxite was on order for 1965. Publication of official trade data was far behind schedule, necessitating use of supplementary sources to reflect partial trade patterns. Thus, in substitution Japanese import tables and oil export tables are included indicating major components in addition to tin.

TABLE 2.—Indonesia: Exports of selected metals and minerals to Japan [1]

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964
Metals:			
Bauxite	480,452	568,316	614,869
Manganese ore	7,666	7,828	5,614
Nickel ores and concentrates	14,983	30,913	39,500
Tin metal ... long tons	15		117
Petroleum:			
Crude ... thousand 42-gallon barrels	32,084	38,450	40,820
Heavy fuel oil ... do	1,191	1,210	2,558

[1] Data shown in lieu of official Indonesian import figures.

Source: Official trade returns of Japan.

TABLE 3.—Indonesia: Exports of crude oil and petroleum refinery products by company and destination

(Thousand 42-gallon barrels)

	1963		January through June 1964	
	Crude oil	Refined products	Crude oil	Refined products
By company: [1]				
Caltex	78,615	446	39,280	
Shell		32,209		10,303
Stanvac	3,922	10,522	3,483	3,557
PERMINA	8,489		4,150	
PERTAMIN	2,920		1,137	
Total	93,946	43,177	48,050	13,860
By destination:				
Japan	41,189	817	22,140	815
Australia	24,340	4,699	10,375	1,522
Malaysia		25,203		
United States	17,420	100	8,618	23
Philippines	8,696	86	5,547	31
Europe and North Africa		5,434		3,664
Thailand and Laos		2,810		
Viet-Nam and Cambodia		1,728		892
New Zealand		1,526		
India			1,205	43
Other	2,301	774	165	[2] 6,870
Total	93,946	43,177	48,050	13,860

[1] Caltex Pacific Oil Co.; P.T. Shell Indonesia; P.T. Stanvac Indonesia; P.T. Perushaan Minjak Nasional; and Pertambagan Minjak Indonesia.

[2] Mostly to Sambu and Bukom Islands for transhipment.

COMMODITY REVIEW

METALS

Aluminum (Bauxite).—Indonesia signed a 3-year contract with Japanese aluminum refiners for 1.9 million tons of bauxite from Bintan beginning in January 1965. Bintan has been supplying about 40 percent of Japanese bauxite requirements, and the contract represented a sizable increase over shipments scheduled in 1962–64. No progress was reported on the proposed Asahan aluminum plant, which was to be completed by 1969 with Soviet assistance.

Copper.—Yugoslavia signed a production-sharing agreement with Indonesia in preparation to explore copper deposits once mined by the Japanese at Sankoropi, in the Toradja district, South Sulawesi. Depending on outcome of studies, the project could result in a major installation.

Gold and Silver.—Tjikotok Mines Imbohe Pelabuhan Ratu, in West Java, reportedly produced a record 6,100 troy ounces of gold in 1964. Silver was also produced in sizable quantity. Studies were made to recover lead and expand gold-silver production. Reserves were expected to keep them in operation another 13 years. Gold was also produced from tin dredging and a few small unrecorded lode operations. A potentially rich gold region. Tjimahv was under study. Oost Borneo Maatschappij (Netherlands) and the Indonesian Government signed an agreement allowing the former to resume gold mining in the Meulaboh area, Southwest Atjeh, Sumatra. Scheelite was found in ores of the old Totok gold mine, closed since 1921, and in beach sands from Rata Totok, North Sulawesi, but quantities were not determined.

Iron and Steel.—Steel, in short supply, was imported mainly from West Germany and increasingly from the U.S.S.R. and mainland China, with nearly all imports based on loans and foreign aid. Construction continued at a slow pace on the Soviet-financed $35.5 million 100,000-ton Tjilegon (Trikora) steel and tinplate plant in West Java. Domestic scrap and imported pig iron will be used as raw materials. Completion date for the rolling mill was set in 1966 and for the open-hearth portion in 1967.

The search by Soviet technicians for iron ore in Kalimantan to provide a basis for an integrated iron and steel industry apparently met with little success. The future for the proposed $20 million Lampung blast-furnace steel mill, to be financed by West Germany and possibly other European countries, was still uncertain. Iron ore resources in the area appeared to be inadequate.

Manganese.—Only one of Indonesia's four manganese mines operated in 1964, accounting for the drop in production beginning in January. Exports, all to Japan, were over 5,000 tons and were partly from accumulated stocks.

Nickel.—Exports of nickel ores to Japan in 1964 were nearly triple the tonnage of 1962. Output came from Japanese production-sharing projects on Mantang and Lemo Islands, both deposits near exhaustion, and at Pomalaa, Southeast Sulawesi. Reserves in the Kilat Hills of Pomalaa have been recently estimated to be close to 6 million tons of 3 percent nickel ore. Sulawesi Nickel Development Cooperative Co.

(Japan), taking part with the Government to develop Celebes nickel deposits, contracted for delivery of 106,000 tons of nickel ore by November 1965 and hoped to obtain another 100,000 tons by March 1966. Japanese processors planned to sell some 5,000 tons of aluminum plate and products to Indonesia in return. Nickel deposits in the Malili district of Sulawesi were under development. Oost Borneo Maatschappij (Netherlands) negotiated for rights to develop nickel-cobalt deposits in Waegio.

Tin.—After falling to a 14-year low of less than 13,000 tons in 1963, tin production recovered and increased one-fourth in tonnage and an estimated two-thirds in value as Dutch technicians assisted and supplied needed dredge parts. Output from the Bangka deposits totaled 9,871 long tons, and deposits in Belitung and Singkep produced 6,474 tons. Nearly all concentrate was exported to the Netherlands and smelted at the Billiton Arnhem plant.

Stockpiling of concentrate was said to have started in October at the 20,000-ton tin smelter, under construction by Klogner Industrie Andagen (West Germany) at Muntok on Bangka Island in preparation for trial runs, but the plant was not expected to be in regular operation until after mid-1965. The deteriorating condition of its tin mining equipment remained a continuing problem. Belitung, in a Riau free-trade zone, was the best equipped and supplied of the tin mining areas. The country was trying to restore its mining centers and boost tin production to a yearly 25,000 tons by 1970. Indonesia State Mining Enterprises placed an order with several West German firms for $7.5 million worth of tin dredging equipment. Plans for a United Nations special grant for a 3-year project to explore for offshore tin appeared indefinite.

Twenty-four tin dredges of Netherland manufacture and the Pemali tin mine on Bangka Island were under renovation by Industriele Handelscombinatie Holland (The Hague). A second large deep sea dredge, similar to one still under construction, was expected to be purchased from Simon and Lobnitz Co., Ltd. (United Kingdom). The $7.3 million dredge was to be backed by 5-year credit risk coverage by the British Export Credit Guaranty Department. The second dredge was to be purchased from proceeds of operating the first.

NONMETALS

Asbestos.—Indonesia and Japan signed an agreement to survey asbestos deposits on Halmahera Island. A production-sharing development was envisioned. Optimism over the deposits had been generated after earlier studies by Nippon Asbestos Co. (Tokyo) in 1957, but Netherland geologists had found only minor quantities of grade 7 asbestos.

Cement.—Production fell behind at the Gresik cement plant, the source of two-thirds of Indonesian cement output, following labor and organizational disputes. A fourth kiln was slated for installation to boost capacity, currently rated at about 400,000 tons per year. The 100,000-ton-per-year Tonassa Cement Manufacturing Plant, financed by Czechoslovak credits, was about 30-percent complete at yearend, and was scheduled to be operational in 1967. Many delays have been experienced as funds were diverted. Siantar was chosen over Boharck, in North Sumatra, as the site for a $10 million 250,000-ton-per-year cement plant. A 20,000-ton-per-year cement plant to be financed by Communist China was planned near Den Pasar, on Bali. Trass from the slopes of Muria Mountain was used in a 6,000-ton-per-year lime-pozzolan plant that started operating at Semarang.

Phosphate.—Work on the Soviet-financed superphosphate plant at Tjilatjap continued, but progress was reportedly slow, with possibly one-fifth of construction completed at yearend. Production was not expected to begin until 1966, with full production scheduled for 1967. It was assumed that raw materials for the plant would be imported, since geological studies have failed to locate adequate supplies of phosphate rock in Indonesia.

Soda Ash.—A survey for a soda ash plant was scheduled for completion in 1964, but construction was delayed at least until 1967. Raw materials were to come from deposits at Kalianget, Medura. The plant will be situated either on Medura or at Padang, Sumatra. Planned annual capacity was 40,000 tons each of soda ash and caustic soda.

Sulfur.—Small tonnages of sulfur were produced from fumarole deposits associated with active volcanoes. Crude sulfur was melted into 95 percent pure sulfur pigs at the rate of 1 ton per day at one crater, Gunung Ambang. A proposal to establish a $1.5 million sulfur-refining plant near Djakarta was studied. In addition to natural sulfur, an estimated 50 tons per day of sulfuric acid was produced in oil refinery acid plants. Sulfur-consuming industries continued to rely on imports for most of their requirements.

MINERAL FUELS

Coal.—East Germany was expected to grant Indonesia $10 million credit in early 1965 for equipment to help expand annual output at the Bukit Asam coal mine in South Sumatra from 450,000 tons to between 2 and 2.5 million tons. Open pit Bukit Asam, Indonesia's largest coal mine, was considered more suitable for expansion than other mines. Poland continued its assistance in expanding and modernizing the second most important coal mining operation in the country, at Ombilin, near Padang. Annual output of coal was 1 million tons. In spite of these activities, 1964 coal production plummeted one-fourth to the lowest on record. Lower coal output was a factor in rising domestic petroleum consumption.

Petroleum.—Output and exports of crude petroleum registered moderate increases over 1963 levels. A decrease in exports of refined products reflected the higher proportion of these products going to Indonesian markets. Crude oil output of private companies was as follows, in thousand 42-gallon barrels: Caltex Pacific Oil Co., 103,573; P. T. Stanvac Indonesia, 20,212; and P. T. Shell Indonesia, 31,037. Government companies, PERTAMIN, PERMINA, and PERMIGAN, produced an estimated 16 million barrels of crude petroleum.

Pressures for nationalizing oil companies continued to influence working conditions at refineries and in the oilfields, but production showed signs of improvement, despite brief disruptions. Private companies continued to operate along the lines of their 1963 contractual agreements with the Government, under which foreign-owned oil companies were made contractors to the Indonesian State companies. Distribution of oil products was largely (60 to 70 percent) in the hands of the State oil companies. Stanvac's east and central Java marketing and distribution facilities were transferred to the Government at yearend. PERTAMIN assumed responsibility for fuel marketing in Indonesia and PERMINA for lubricants. The 1963 Tokyo Agreement had provided for 20-year operation contracts for U.S. companies followed by transfer of facilities to the Government, but marketing and distribution facilities were to be transferred within 5 years. A speedup of transfers was taking place as it was recognized that new investments would be curtailed anyway. Government management teams were being introduced and, although foreign personnel continued to supervise oil production, the position of private owners was clearly deteriorating. Eventual disposition of property claims remained to be clarified. U.S. companies were said to have in jeopardy investments as high as $400 million, and Dutch-British Shell over $100 million.

There were no discoveries of oil reliably reported in 1964, but Caltex was sending equipment into the Petanni area, where a major producing field may have been discovered. A number of companies including United States, French, and Japanese firms were competing for exploration concessions. The signing of a decree in late 1963 initiated an 8-year $48 million program covering about 17 million acres in Sumatra and Borneo under terms of a 60–40 Government-sided profit-sharing agreement.[2] Pan American Indonesia Oil Co., partly owned by Standard Oil of Indiana, had been largely unsuccessful in its Central Sumatra explorations since mid-1962, and was one of those, including Stanvac, Caltex, and Shell, awarded new concessions. Government oil companies were also active in explorations through agreements with foreign contractors.[3]

Japanese oil firms and the Indonesian Government formed Far East Oil Trading Co. to import crude oil directly to Japan without going through channels of the international oil companies. Initial $30 million capital was advanced by the Japanese, and shipments by the company increasing from 6 to 37 million barrels annually were envisioned.

---

[2] Knowles, Ruth Sheldon. Eight-Year Exploratory Campaign Planned for Indonesia. World Petrol., v. 35, No. 2, February 1964, pp. 38–41.

[3] Petroleum Press Service. Expanding Search in Indonesia. V. 31, No. 6, June 1964, pp. 212–214.

The Mineral Industry of Japan

By K. P. Wang[1]

⁂

JAPAN'S mineral industry ranked about sixth in the world in 1964. Its estimated mineral and metal output value (mine output value plus added value derived from smelting and processing) in 1964 was approximately $5,000 million, about equal in magnitude to that of France and considerably more than that of mainland China. The mining industry was only of moderate significance. However, the metallurgical industry was very large and diversified to meet the demands of the Japanese industrial-manufacturing economy.

While Japan's mineral resource base has proven stronger than generally suspected in the past, raw material requirements have far exceeded domestic supplies of most commodities, necessitating large imports from many parts of the world. Possessing an advanced technology, the country processed various crude ores into finished mineral and metal products partly or primarily for export. To meet domestic and foreign demand, many mineral commodities were produced in significant quantities.

The country ranked third behind the United States and the Soviet Union in output of steel, having overtaken West Germany during 1964. Japan was a significant world producer of refined zinc and copper, with a domestic ore base relatively stronger in zinc than in copper. Japan retained fifth rank in aluminum output and was surpassed only by the United States in titanium production. It also was a prominent producer of ferroalloys, minor metals, and high-purity metals. Among the world's producers of nonmetals, Japan ranked first in pyrite and pyrophyllite, and third in cement. The country was a most significant refiner and consumer of crude oil, ranking about third among refining nations, and produced sizable quantities of coal. Output of many additional mineral commodities constituted 1 to 2 percent of the world totals.[2]

Steel, Japan's premium industry, completed more new capacity in 1964 than did the steel industry of any other country. A slight slowdown, however, was imminent at yearend. Japanese contribution to steel technology was outstanding, particularly with regard to raising operational efficiency, modifying processes, and improving quality control through increased automation. Noteworthy developments in the nonferrous base metals industry were construction of the large Onahama copper smelter by the Mitsubishi Metal Mining Co., Ltd. (together with others), discovery of more high-grade "black ore" in northern Honshu, establishment of the Sumitomo ISP (Imperial Smelting Process) Co. to build a large lead-zinc smelter near Kobe, and expansion of the Mitsui Kamioka (mainly zinc) enterprise. Additional giant-sized cement kilns were being installed, despite signs of declining prices and possible overproduction. The Japanese coal industry was still hurting from a catastrophic mine explosion at its leading coal mine, Miike, of Mitsui Coal Mining Company, Ltd., in November 1963. Oil refining and consumption moved ahead at a pace even faster than in the previous year, despite a severe earthquake that hit the Niigata refining center on June 16, 1964. Although Japan's oil concession in the Kuwait-Saudi Arabia Neutral Zone continued to show great potential, the high sulfur content of the oil proved to be a problem.

---

[1] Chief specialist, East Europe-Far East, Division of International Activities.

[2] Wang, K. P. The Mineral Industry of Japan. Ch. in BuMines Minerals Yearbook 1963, v. 4, table 1, World Significance of Selected Japanese Metal and Mineral Products in 1963, p. 1342.

GOVERNMENT POLICIES AND PROGRAMS

The Japanese Government continued in 1964 to pursue the policy of maximum development of domestic resources and importation of deficient items as required. With the Japanese industry operating under the private enterprise system, the Government exercised regulatory functions only to a moderate extent while carrying out definite mineral policies.

Government programs related to domestic mining[3] included a Temporary Stabilization Act to enhance the internationally competitive position of the metal mining industry; assistance in prospecting through loans and subsidies; special surveys by the Geological Survey; financing by the Japan Development Bank and Hokuto Finance Corporation for modernization and installation of mineral facilities; tax benefits through a special depreciation system related to prospecting costs, and consideration of introducing depletion allowance; price stabilization measures; and special measures to aid small mines, such as subsidies amounting to half of the propecting cost, subsidies for modernization and installation of equipment based on the Medium and Small Business Act of 1964, and consulting services for management, technical cooperation, financing, and taxation. At yearend, consideration was given to granting tax privileges to "deep" mines.

The Government continued to exert considerable influence on mineral and metal imports through foreign exchange controls, import quotas and duties, and direct and indirect financing. Japanese companies were urged to present a united front abroad in developing and purchasing minerals. The policy has been to spread raw material imports in as many areas as possible to insure dependability of supply and balanced trade with various countries. Many large Japanese ore carriers were constructed so as to reduce shipping charges from distant lands. The quasi-governmental Overseas Mineral Resources Development Co. expanded its activities in 1964 to help develop high-risk mines abroad.

---

[3] Mining Industry Study Team, Japan Productivity Center (Tokyo). Recent Metal Mining Industry in Japan, 1964, pp. 1–9.

The Government continued to encourage rationalization and modernization of metallurgical and refining facilities that process both indigenous and imported raw materials, promote the establishment of new facilities according to need, pass judgment on important large projects, allocate production quotas among individual companies, and help hold back construction programs in times of economic stress.

In 1964, foreign capital (particularly U.S. capital) remained heavily involved in the oil, aluminum, and mining equipment industries as a result of Japanese laws designed to attract foreign investment, loans, and technical assistance. In contrast, the steel industry, which used foreign loans and technical licensing arrangements to accelerate development, was solidly in Japanese hands. Most large nonferrous base metal concerns also remained predominantly financed by Japanese capital, but more of these were joining with foreign capital in developing mineral enterprises. The Japanese Government retained the power of approval over specific projects involving foreign participation.

With regard to the overall economy, the Japanese Government pursued a policy in late 1964 of restricting credit, holding back slightly the hitherto phenomenal increase of the gross national product (GNP), and slowing down construction and investment to manageable proportions. This was necessitated by the balance of payment deficit, rising wages and tight labor market, reduction of profits by industrial concerns despite increased production, and signs of impending difficulties in maintaining high exports.

"Japan has taken a decisive step towards economic liberalism [in 1964] by adhering to Article 8 of the IMF [International Monetary Fund] and freeing payments and imports, and when it joined the Organization for Economic Cooperation and Development [on April 28, 1964]," nevertheless "the Japanese attitude towards liberalization is still cautious and pragmatic."[4]

PRODUCTION

Japan's overall mineral output value in 1964 was more than 10 percent higher than in 1963, following the trend of recent years. Production based upon domestic raw materials has been static, whereas that based upon imported raw materials has shown radical increases. The large and modern metallurgical industry, exemplified by the steel sector which relied primarily on foreign raw materials, has expanded greatly in the last 5 years.

The Mining Yearbook of Japan, published annually by the Ministry of International Trade and Industry (MITI), contains fairly complete statistics but gives only partial information on the country's mineral output value. For 1963 (the last year available) $1,816 million was credited as the output value. By adding major omitted items, such as the estimated added values derived from domestic-raw-materials-based cement and steel and imported-raw-materials-based steel, nonferrous metals, and oil, the actual total would be about $4,500 million for 1963. The $5,000 million estimate made for 1964 was equivalent to about 7.2 percent of the gross national product (preliminary figure for the 1964 GNP was about $69.5 billion).

---

[4] The Economist (Tokyo). Year of the Open Door: The Economist Reconsiders Japan, Nov. 28, 1964, pp. 1003–1004.

TABLE 1.—Japan: Reported value of selected mineral product groups, 1963[1]

(Million U.S. dollars)

Commodity group	Value of crude output	Value added by processing	Total
Nonmetal ores	106	68	174
Primary metals other than iron	410	57	467
Byproduct metal ores	175	117	292
Coal	486	321	807
Oil and gas	47	29	76
Total	1,224	592	1,816

[1] Includes only value of items produced from domestic raw materials; excludes added value derived from domestic-based cement and iron and steel and sizable mineral output values derived from processing imported raw materials such as metal ores and crude oil.

Steel, chiefly as a result of value added through processing imported raw materials, accounted for nearly two-fifths of the 1964 mineral output value; and domestic coal and oil refining, each about one-sixth. Added values for metals produced from domestic ores and output values for domestic metal ores and cement were all in the 6- to 9-percent range. Added value for processing imported nonferrous ores and output value for nonmetals were in the 3- to 5-percent range.

During 1960–64, output of steel and aluminum approximately doubled, and output of cement increased by nearly one-half. Coal production has declined slightly in every year since 1961 because of competition from other energy materials. Petroleum refining and consumption registered a phenomenal rise, with oil furnishing more than half of the 1964 energy supply. Mine output of copper and zinc rose only moderately, but refined production of both metals increased by nearly 100,000 metric tons in the 5-year span. Almost all of the minor metals and nonmetals showed significant production increases. Japan's overall mineral consumption rose radically from 1960 to 1964.

By yearend 1964 Japan was producing at an annual rate of 42 million tons of steel, 33 million tons of cement, some 65 million tons (roughly 500 million barrels) of refined oil, and 50 million tons of coal. Among the lesser but still important mineral products, the country was also producing over 1 million tons of primary refined nonferrous metals, half a million tons of ferroalloys, and nearly 4 million tons of various kinds of pyrites.

TABLE 2.—Japan: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Alumina	354,788	420,518	424,469	510,539	885,741
Metal, ordinary	131,239	152,513	169,664	222,073	263,862
Metal, superpure	1,984	1,186	1,786	1,869	1,898
Oxide, fused	NA	NA	35,830	33,728	36,876
Antimony:					
Mine	271	195	172	192	503
Regulus (metal)	1,618	2,127	2,268	2,067	2,325
Oxide	1,021	1,237	1,091	1,175	1,615
Arsenic (white)	1,131	950	917	820	490
Bismuth, metal...kilograms	118,429	191,566	259,839	[r] 373,450	506,038
Cadmium, metal	568	724	883	1,012	1,215
Cerium...kilograms	42,395	65,630	96,181	[r] 122,361	NA
Chromium:					
Concentrate, almost all low-grade	67,489	[r] 70,192	58,082	43,731	43,969
Metal	642	510	211	[r] 456	[e] 500
Cobalt...kilograms	17,768	5,365	48,385	20,273	16,380
Copper:					
Mine	89,183	96,409	103,620	[r] 107,217	105,982
Metal, primary electrolytic	248,108	277,005	270,430	295,201	341,699
Metal, secondary	NA	NA	87,881	88,863	118,086
Germanium, metal...kilograms	22,140	24,373	22,368	14,493	23,962
Germanium, oxide...do	11,727	14,724	18,619	[r] 14,385	NA
Gold, refined...thousand troy ounces	[r] 336	[r] 379	[r] 421	[r] 433	460
Iridium...troy ounces	112,142	139,084	150,658	NA	NA
Iron and steel:					
Direct smelting ore...thousand tons	1,290	1,159	1,144	[r] 1,127	1,135
Iron sands...do	1,564	1,712	1,443	[r] 1,295	1,388
Pyrite sinter...do	1,876	1,909	2,004	[r] 1,767	1,926
Pig iron...do	11,896	15,821	17,972	19,936	23,778
Ferroalloys:					
Ferrochrome	80,420	100,095	84,528	81,880	136,792
Ferromanganese	155,603	185,531	166,593	165,594	211,590
Ferromolybdenum	1,786	1,985	505	1,017	1,429
Ferronickel	55,334	62,647	35,972	46,883	78,323
Ferrosilicon	75,062	98,120	75,355	94,174	113,792
Ferrotitanium	227	456	457	172	NA
Ferrotungsten	1,197	1,703	883	760	1,178
Ferrovanadium	859	1,289	608	1,287	1,128
Silicomanganese	57,693	95,849	NA	NA	NA
Steel ingots...thousand tons	22,138	28,268	27,546	31,501	39,799
Rolled steel, hot rolled...do	16,051	20,392	20,809	23,307	29,381
Lead:					
Mine	39,532	46,280	53,455	[r] 52,717	54,078
Metal, primary refined	74,193	83,283	92,192	101,106	107,961
Metal, secondary refined	NA	NA	NA	[r] 68,182	61,338
Magnesium	2,144	2,247	2,087	2,439	2,937
Manganese:					
Ore, mostly low-grade	323,984	304,121	308,590	[r] 276,717	282,977
Oxide	3,507	7,477	9,396	[r] 10,308	NA
Metal, electrolytic	4,028	4,568	4,800	[r] 4,952	[e] 5,000
Mercury:					
Mine	200	189	153	[r] 169	161
Metal	1,158	875	566	641	358
Molybdenum:					
Mine, MoS_2	635	610	623	553	NA
Metal...kilograms	86,617	90,346	106,667	[r] 134,087	[e] 150,000
Nickel: Metal	5,553	6,065	5,665	6,190	6,673
Palladium...troy ounces	563	1,550	1,372	1,326	1,874
Platinum...do	1,396	2,247	1,872	1,714	2,199
Selenium...kilograms	126,206	136,198	140,304	142,200	NA
Silicon, high-purity...do	2,606	4,068	6,315	10,743	13,608
Silver, electrolytic...thousand troy ounces	10,420	12,514	14,753	15,214	15,966
Tantalum...kilograms	NA	5,702	4,704	5,319	11,298
Tellurium...do	6,201	7,478	10,509	6,013	3,435
Tin:					
Mine...long tons	842	852	859	[r] 884	807
Metal, electrolytic and fire...do	1,260	1,644	[r] 1,903	[r] 2,040	2,027
Titanium:					
Slag	1,310	1,609	524	874	1,960
Metal	2,307	2,283	1,513	1,759	2,993
Tungsten:					
Concentrate	835	825	920	651	715
Metal	488	570	440	[r] 516	703
Zinc:					
Mine	156,734	168,259	192,481	[r] 197,956	215,549
Metal, electrolytic	109,540	135,743	158,895	177,127	202,224
Metal, distilled	70,918	76,688	86,413	87,210	83,529
Sulfate	28,200	27,685	24,944	[r] 26,405	28,606
Oxide	5,153	4,726	6,656	[r] 8,425	NA
Zirconium...kilograms	52,178	44,377	83,000	[r] 53,000	NA

See footnotes at end of table.

TABLE 2.—Japan: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Nonmetals:					
Asbestos, chrysotile	15,460	17,054	13,977	16,520	16,310
Barite	22,847	29,250	38,116	[r] 37,521	38,111
Bromine	1,951	2,772	2,887	[r] 3,546	4,681
Cement (excluding white) thousand tons	22,537	[r] 24,636	[r] 28,787	[r] 29,948	32,950
China clay (kaolin)	21,279	26,939	71,860	[r] 99,221	114,050
Dolomite thousand tons	1,702	1,874	1,796	[r] 1,752	1,838
Feldspar, aplite	84,378	124,848	162,254	[r] 206,613	256,316
Fire clay thousand tons	826	1,002	904	[r] 813	914
Fluorspar	9,170	14,811	15,531	[r] 20,899	19,032
Graphite:					
Amorphous	1,037	481	428	457	394
Crystalline	3,480	2,999	3,030	[r] 2,541	2,056
Gypsum thousand tons	735	725	800	783	753
Iodine	950	1,120	1,409	1,686	2,025
Lime, quick thousand tons	NA	NA	1,171	[r] 1,385	1,631
Limestone do	38,519	44,026	49,964	[r] 53,857	60,603
Phosphates (superphosphates) do	2,150	1,879	1,809	[r] 1,663	1,661
Potash, carbonate	4,230	4,184	5,906	5,583	7,565
Pyrite thousand tons	2,057	2,273	2,349	2,345	2,764
Pyrrhotite do	258	244	231	210	
Cupriferous pyrite do	384	384	445	[r] 497	NA
Salt do	[r] 886	[r] 828	[r] 856	[r] 782	887
Pyrophyllite	251,072	283,546	266,575	[r] 288,639	320,211
Sulfur, refined from ore	247,593	242,282	223,975	[r] 222,210	291,223
Sulfur, recovered from oil	8,460	8,294	8,686	11,612	18,744
Sulfur ore, for making acid thousand tons	725	736	656	NA	NA
Sulfuric acid do	4,452	4,683	4,910	4,991	5,372
Talc	50,728	55,853	57,237	[r] 68,051	94,983
Silica:					
Soft silica stone thousand tons	1,760	1,891	2,139	[r] 2,124	2,151
High-grade sand	1,097	1,380	1,524	[r] 1,603	1,684
Mineral fuels:					
Coal:					
Anthracite thousand tons	[r] 1,802	[r] 1,893	[r] 1,874	1,798	1,709
Bituminous do	[r] 48,921	[r] 52,151	[r] 52,017	[r] 49,748	48,673
Lignite do	[r] 1,376	[r] 1,283	[r] 1,061	[r] 934	691
Coke from coal:					
From coke ovens do	8,549	10,913	11,548	[r] 11,247	12,933
From gas plants do	3,720	3,797	3,454	3,374	3,721
Natural gas million cubic feet	27,297	35,464	45,120	63,243	[r] 65,700
Petroleum:					
Crude thousand 42-gallon barrels	3,678	4,590	5,316	[r] 5,646	[r] 4,818
Refinery products:					
Gasoline do	38,491	45,645	50,362	58,370	62,507
Naphtha do	-------	-------	14,621	20,651	31,142
Jet fuel do	2,267	3,016	3,396	4,299	6,344
Kerosine do	13,316	14,606	18,649	24,779	28,395
Gas oil do	14,722	18,229	22,270	29,498	34,401
Fuel oil A do	7,794	10,207	11,185	11,926	16,329
Fuel oil B do	27,617	29,992	32,750	34,788	38,677
Fuel oil C do	69,772	89,296	107,175	153,111	189,456
Lubricating oil do	4,039	4,632	5,099	5,403	7,250
Liquefied petroleum gas	357,414	582,471	760,812	1,452,452	2,041,076
Paraffin	45,797	45,680	49,102	54,200	67,033
Petroleum asphalt	469,214	605,580	622,933	944,318	1,302,520
Petroleum coke	9,759	56,865	59,414	69,660	84,140
Petroleum grease	31,416	34,599	36,344	35,876	37,990
Total refinery products thousand 42-gallon barrels	190,620	234,080	280,260	[r] 361,100	439,800
Carbon black	24,990	42,609	66,690	[r] 80,233	110,497

[r] Revised. NA Not available.
[e] Estimated.

Sources: U.S. Embassy, Tokyo, Japan. Mineral Production Statistics Questionnaire 1964. State Department Airgram A-1422, Apr. 21, 1965. Mining Yearbook of Japan, 1959–63. Ministry of International Trade and Industry. Petroleum Yearbook of Japan, 1961–63. Ministry of International Trade and Industry.

TRADE

Japan remained an important world trader of mineral raw materials and products, prominent both as an importer and an exporter. Steel semimanufactures represented by far the leading class of Jap-

TABLE 3.—Japan: Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Metals:				
Aluminum:				
Alumina	97,279	102,100	104,268	United States 91,373; Australia 11,275; Thailand 577.
Metal:				
Unwrought	5,493	14,095	19,173	United States 14,540; Argentina 3,000; Thailand 730.
Semimanufactures	12,618	r 15,639	17,187	United States 4,751; Hong Kong 2,314; Burma 1,871; Singapore 992.
Bismuth and alloys, all forms	89	162	249	United Kingdom 236; India 9; France 4.
Cadmium and alloys, all forms	259	r 194	351	United Kingdom 234; United States 55; France 27; Netherlands 21.
Copper metal:				
Cathodes and wire bars	2,082	r 1,454	1,560	All to Taiwan.
Semimanufactures	16,154	18,307	26,652	Hong Kong 6,929; United States 5,521; Philippines 3,991; Thailand 3,045.
Iron and steel:				
Ferroalloys:				
Ferrochrome	12,485	7,964	3,861	United States 1,918; United Kingdom 1,202.
Ferromanganese	21,429	14,385	8,864	United States 6,680; United Kingdom 1,431.
Ferrosilicomanganese	6,567	3,760	434	United States 333; Singapore 51.
Ferrovanadium	281	382	327	All to North Korea.
Other	4,065	860	NA	
Semimanufactures:				
Coils for rerolling thousand tons	81	272	631	United States 210; Italy 187; Spain 120.
Wire rod in coils do	383	479	545	United States 441; Taiwan 22; India 21.
Bars and rods do	542	840	632	Hong Kong 129; United States 126; U.S.S.R. 61; Thailand 59.
Angles, shapes and sections. do	116	235	403	United States 189; Australia 64.
Plates and sheets:				
Heavy, uncoated. do	404	464	680	United States 218; Australia 76; India 73.
Medium, uncoated. do	93	129	102	United States 21; Taiwan 10; New Zealand 8; India 7.
Thin, uncoated. do	816	1,054	1,338	United States 328; Philippines 136; Thailand 111; India 87; mainland China 65.
Tinplate do	124	186	296	United States 41; Taiwan 29; Philippines 26; Australia 26; mainland China 25.
Galvanized do	306	420	503	United States 133; Burma 44; mainland China 28; India 24; Indonesia 21; Venezuela 20.
Wire do	251	269	329	United States 156; Thailand 32; India 23.
Pipes and tubes:				
Seamless do	166	230	253	United States 43; mainland China 36; Canada 22; U.S.S.R. 20.
Welded, clinched, and other. do	273	465	668	United States 387; Iran 36; India 35; Hong Kong 25.
Magnesium and alloys, all forms	120	20	22	United States 20.
Manganese dioxide	7,960	r 9,048	11,577	Hong Kong 1,714; United Kingdom 1,486; West Germany 1,093; Thailand 992.
Molybdenum and alloys, all forms.	7	28	125	Mainland China 82; Australia 36; U.S.S.R. 3.
Selenium	51	48	46	United States 10; India 9; Italy 9; West Germany 5; United Kingdom 4.
Silver troy ounces	r 668,699	r 93,808	2,912,866	South Korea 2,888,060; Taiwan 11,324.
Titanium:				
Dioxide:				
Rutile type	11,671	13,234	20,812	United States 2,553; Sweden 2,266; Argentina 1,709; New Zealand 1,579; Belgium 1,481.
Other	10,369	10,720	15,166	United States 7,304; mainland China 1,516; Hong Kong 902.
Metal, including alloys, all forms.	1,019	1,435	1,689	United States 1,167; United Kingdom 211; Netherlands 191.
Tungsten and alloys, all forms	23	56	15	North Korea 10; South Korea 1; Greece 1.
Nonferrous base metals not elsewhere specified; lumps, powders, and flakes.	3,021	5,670	4,034	United States 984; United Kingdom 951; West Germany 747.

See footnotes at end of table.

TABLE 3.—Japan: Exports of selected metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Nonmetals:				
Cement thousand tons	1,834	2,011	1,782	Hong Kong 365; Pakistan 339; Ryukyu 279; Singapore 260.
Fertilizer, chemical:				
Ammonium sulfate do	926	1,557	855	Mainland China 309; South Korea 139; Taiwan 119.
Calcium super-phosphate. do	66	34	162	Mainland China 136: Indonesia 10 Ryukyu 9.
Other do	321	155	282	South Korea 80; mainland China 59; Phillipines 56; Thailand 33.
Iodine	874	1,128	1,329	United States 555; West Germany 160; France 133; Switzerland 94; India 93.
Phosphorus, red	231	216	316	India 148; Pakistan 50; United States 42.
Sodium compounds: caustic soda.	35,024	30,729	42,602	U.S.S.R. 13,852; India 8,372; Philippines 6,477; Indonesia 4,071.
Mineral fuels: Petroleum refinery products:				
Gasoline. thousand 42-gallon barrels	1,763	2,062	2,271	Ryukyu 1,036; United States 717; Australia 239; Thailand 223.
Kerosine do	553	683	1,383	Ryukyu 334; United States 284; India 227; Hong Kong 223; Singapore 187.
Fuel oil:				
Distillate do	578	578	1,217	South Korea 526; Ryukyu 236; Thailand 187.
Residual do	73	1	193	South Korea 125; American Samoa 66; Philippines 1.
Lubricating oil do	73	2,785	653	Taiwan 285; South Korea 154; Thailand 54; Malaya 47; Singapore 46.
Greases thousand tons	1,189	4,533	1,488	Taiwan 639; Thailand 310; Hong Kong 296.
Jelly and wax do	9	8	12	Pakistan 3; Brazil 2.
Coal tar, pitch, and related materials. do	29	30	37	South Korea 18; France 11; Taiwan 8.
Bitumen do	83	176	96	Thailand 27; Burma 26; Pakistan 17.

[r] Revised. NA Not available.

anese mineral and metal exports, and the country was the world's foremost exporter of such products. This class alone, comprising about 6.4 million metric tons in aggregate weight and valued at about $1 billion in 1964, constituted one-seventh of Japan's total exports. Large quantities of additional steel were exported in the form of finished products. Japan's cement exports of nearly 1.8 million tons, though slightly less than in 1963, still loomed large by world standards. Many other mineral products were exported in lesser amounts. Generally, mineral exports were not as important as mineral imports, since Japan's economy places much greater stress on exports of manufactured products.

Among the major items imported during 1964 were more than 31 million metric tons of iron ore, nearly 5 million tons of steel scrap, 3.3 million tons of pig iron, more than 13 million tons of coal (predominantly coking), about 63 million tons of crude oil, 1.6 million tons of bauxite, more than 350,000 tons of contained copper, more than 300,000 tons of contained zinc-lead, in excess of 500,000 tons of manganese ore, nearly 400,000 tons of chromite, roughly 1 million tons of potash, 2.3 million tons of phosphate rock, and 3.6 million tons of salt. Japan's mineral imports were not only important by world standards but also represented a significant share of the country's overall imports roughly a third of the total value. Among the country's principal imports in 1964, oil, valued at over $1,000 million, and iron ore, valued at $433 million, ranked first and fourth, respectively.

TABLE 4.—Japan: Selected imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Metals:				
Aluminum:				
Bauxite and concentrates of aluminum. thousand tons	1,099	1,421	1,622	Indonesia 615; Malaya 474; Australia 258.
Metal	17,402	16,698	18,532	Canada 14,353; United States 3,418.
Aluminum alloys, wrought and unwrought.	1,045	6,541	17,780	U.S.S.R. 8,672; Canada 6,245; United States 915.
Scrap	17,214	18,526	25,231	United States 17,523; Canada 3,841; Hong Kong 1,026.
Alumina, all forms	833	50,538	51,186	Australia 48,447; United States 1,075; West Germany 510.
Antimony ore and concentrate	5,026	6,196	6,501	Bolivia 3,139; mainland China 1,328; South Africa 1,030.
Chromite [1]	254,882	226,516	396,427	Philippines 137,952; U.S.S.R. 109,838; Iran 42,795; South Africa 39,885.
Copper:				
Ore and concentrate	558,486	600,150	620,381	Philippines 227,179; Canada 200,413; Australia 47,421; Peru 35,449; Chile 34,769.
Ingot	36,713	56,209	119,523	Rhodesia and Nyasaland 73,579; United States 18,458; Mozambique 11.951; Australia 8,339.
Metal and alloy scrap	74,093	82,850	107,907	United States 59,780; Australia 8,703; Canada 8,591.
Iron and steel:				
Iron ore thousand tons	22,445	26,268	31,236	Malaya 6,622; Chile 5,417; India 3,548; Peru 3,494; Portuguese India 3,227.
Pig iron do	1,437	1,543	3,350	U.S.S.R. 1,073; mainland China 998; West Germany 245; South Africa 245.
Scrap [2] do	3,404	4,368	4,986	United States 3,688; Australia 370; India 319.
Lead:				
Ore and concentrate	38,615	68,649	51,704	Australia 20,729; Peru 13,487; Bolivia 4,946; South Korea 4,612.
Metal	26,195	24,021	67,513	Australia 22,422; Peru 18,133; Canada 8,612; U.S.S.R. 8,518.
Magnesium	4	493	872	United States 525; Norway 322; Canada 25.
Manganese ore and concentrate [3]	395,422	367,730	558,951	India 340,087; U.S.S.R. 691,28; New Hebrides 33,918.
Mercury	712	890	1,746	Italy 896; Spain 641; Mexico 96; mainland China 58.
Molybdenum ore and concentrate.	1,306	3,100	5,078	United States 3,971; South Korea 268; Canada 234; mainland China 233.
Nickel:				
Ore and concentrate (low-grade).	674,871	679,496	1,143,228	New Caledonia 1,085,529; Indonesia 39,500; Canada 17,817.
Matte	687	3,937	5,429	New Caledonia 5,338.
Metal and alloy products	1,740	963	3,850	Canada 1,824; United States 757; Norway 637; United Kingdom 316; West Germany 258.
Palladium kilograms	2,721	4,574	5,234	U.S.S.R. 3,773; United Kingdom 1,205; United States 179.
Platinum do	4,150	6,900	5,154	United Kindgom 2,153; U.S.S.R. 1,374; United States 960.
Silver do	122,468	114,305	309,087	United States 225,804; Peru 65,211; South Korea 5,295; United Kingdom 4,963; Burma 4,850.
Tin:				
Ore and concentrate	942	1,614	2,856	Thailand 1,268; Mexico 1,107; Burma 331.
Metal	11,799	14,587	16,278	Malaya 14,226; mainland China 1,477; Singapore 236; North Viet-Nam 199.
Titanium:				
Ore and concentrate	122,298	141,890	185,986	Australia 63,554; Malaya 54,253; Ceylon 35,220; India 18,470.
Slag	28,608	26,739	42,110	All from Canada.
Tungsten concentrate	2,197	2,327	2,852	South Korea 1,147; mainland China 317; Argentina 287; Australia 270.
Vanadium concentrate	603	758	NA	Undetermined.
Zinc:				
Ore and concentrate	144,699	147,506	288,447	Peru 112,509; Canada 38,231; Mexico 37,759.
Metal	8,135	8,404	68,627	U.S.S.R. 16,837; North Korea 7,839; Canada 6,867; Peru 6,184; Australia 5,429; Netherlands 4,996.

See footnotes at end of table.

TABLE 4.—Japan: Selected imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Nonmetals:				
Asbestos	96,674	115,492	143,969	Canada 84,067; South Africa 29,005; U.S.S.R. 13,641; United States 8,128.
Cryolite	3,800	6,411	7,547	All from Denmark.
Fluorspar	102,244	128,892	206,840	Mainland China 69,048; Thailand 36,415; South Africa 34,358; South Korea 30,819.
Graphite:				
Crystalline and special amorphous.	5,070	4,952	6,483	Ceylon 2,222; South Korea 1,650; West Germany 1,415.
Amorphous	61,233	56,346	50,185	South Korea 45,512; North Korea 4,622.
Gypsum	79,628	108,284	90,895	United Arab Republic 42,752; Australia 26,529; Mexico 12,494.
Kaolin	35,975	49,066	53,769	United States 34,148; South Korea 13,177; United Kingdom 4,001.
Magnesia clinker	40,100	20,559	19,528	North Korea 13,567; U.S.S.R. 4,189; mainland China 1,021.
Mica blocks and splittings	1,737	1,853	3,995	India 3,575; Madagascar 201; Brazil 116
Phosphate rock..thousand tons	1,889	2,063	2,316	United States 1,567; Morocco 215 French Oceania 166; Senegal 159.
Potassium chloride	703,058	969,416	992,103	United States 322,114; Canada 303,001; U.S.S.R. 155,559.
Potassium sulfate	39,014	100,861	66,583	France 32,941; United States 26,622; West Germany 7,020.
Natural quartz sand. thousand tons	103	133	179	South Viet-Nam 175; South Korea 4.
Salt..do	2,653	2,948	3,634	Mexico 866; mainland China 698; Taiwan 377; India 311.
Natural steatite (soapstone)	35,150	30,602	33,931	U.S.S.R. 11,790; South Korea 11,400; mainland China 7,893.
Sulfur	1	13,794	24,588	Canada 14,088; mainland China 10,500.
Talc	6,321	15,854	26,827	Mainland China 9,341; South Korea 8,976; U.S.S.R. 4,262; North Korea 3,230.
Mineral fuels:				
Coal..thousand tons	11,928	11,143	13,233	United States 5,750; Australia 4,356; U.S.S.R. 969; Canada 771.
Anthracite..do	1,309	1,238	1,238	North Viet-Nam 403; South Korea 233; South Africa 158; Canada 153; U.S.S.R. 114.
Heavy coking coal (less than 8 percent ash). do	5,799	5,707	6,856	United States 5,552; Australia 1,083; U.S.S.R. 168.
Heavy coking coal (more than 8 percent ash). do	2,710	2,736	3,450	Australia 2,121; U.S.S.R. 685; Canada 516; mainland China 114.
Other bituminous coal (mostly for coking). do	2,110	1,462	1,689	Australia 1,117; Canada 212; United States 188.
Petroleum:				
Crude thousand 42-gallon barrels.	289,510	374,636	454,004	Kuwait 124,807; Iran 87,644; Saudi Arabia 81,696; Indonesia 24,395.
Residual fuel oil..do	60,999	67,540	76,499	United States 11,707; Kuwait 11,403; Saudi Arabia 8,718; U.S.S.R. 7,753; Iran 6,364.
Lubricating oil..do	2,082	2,523	3,235	United States 2,494; Kuwait 280.
Greases..thousand tons	5	73	52	United States 51; United Kingdom 1.
Petroleum coke..do	417	592	890	United States 840; Rumania 28; mainland China 15.

NA Not available.

[1] Refractory and metallurgical chromite lumped together. Most Philippine supply is refractory chromite.

[2] Includes only scrap fit for smelting. Several hundred thousand tons annually of scrap fit for remanufacturing are not included.

[3] Includes ferruginous manganese ore, which amounted to 115,430 tons in 1963 and 226,424 tons in 1964.

The United States was Japan's foremost trading partner, and Japan was the second best customer of the United States, with the balance of payments in favor of the United States. More than one-fourth of Japan's imports and exports of mineral and metal products were with the United States. American coking coal, steel scrap, molybdenum concentrate, phosphate rock, and potash were particularly important to Japan, and Japanese steel products found a large market on the U.S. west coast. The Near East provided more than four-fifths of Japan's crude oil imports, including an important share from Japanese concessions in the Kuwait-Saudi Arabia Neutral Zone. Malaysia was the main source of tin and the leading supplier of iron ore. India, Chile, and Peru also furnished large amounts of iron ore. The Philippines, Australia, Canada, and Peru were the prominent suppliers of nonferrous base metals (mostly in concentrate form). The Soviet Union and mainland China provided more mineral products than in the recent past, and Australia was considered a potential mineral storehouse that could furnish increasing quantities of raw materials to Japan. Although emphasis has been placed on closer areas, such as Southeast Asia, South Asia, and Australia, Japan continued to draw mineral supplies from all over the world. For example, the Japanese were even interested in investigating a large manganese deposit in Upper Volta, Africa. Japanese steel products also were shipped to many parts of the world. The principal foreign markets for Japanese cement and fertilizers were within the Far East.

Japan's continuing worldwide quest for mineral raw materials served to maintain both domestic and international pressures to liberalize import regulations, and changes in these controls led Japanese economists to call 1964 the "Year of the Open Door." In the case of mineral imports, lead and zinc regulations were liberalized in April (however the "flexible duty system" was retained). Prior mineral commodity "liberalizations" had been applied to nickel (October 1961), crude oil (October 1962), and copper and mercury (April 1963, with the "tariff quota system" temporarily retained and finally removed in 1964). However certain mineral and other products were still controlled at yearend by foreign exchange allocation limitations, import quotas, and domestic industry protective tariffs. The Japanese concept of liberalization was to generally reduce restrictions and tariff levels to permit more open competition, but in the case of some commodities, duties on quantities of material in excess of quotas were momentarily higher than prior to liberalization.

COMMODITY REVIEW

METALS

Iron and Steel.[5]—Japan became the third largest producer of steel in 1964, attaining an output 34.6 percent of that of the United States and 47.3 percent of that of the Soviet Union. The 39.8-million-ton production surpassed that of the Federal Republic of Germany (West Germany) by nearly 2.5 million tons and represented a 26.3 increase over 1963 production. Oxygen converter steel accounted for the bulk of the increase, topping open-hearth steel for the first time and by a wide margin. In fact, Japan has been the leading world producer of oxygen converter steel in the last few years. Pig iron production also rose substantially, being three-fifths of the steel in 1964. Japan retained its position as the third ranking producer of alloy steels. The upward trend in steel production is expected to continue, although at a slower pace. In 1964, the Japanese steel industry made investments of nearly $500 million.

---

[5] Far East Iron & Steel Trade Reports (Tokyo). No. 122, Mar. 12, 1965, pp. 1–20.

TABLE 5.—Annual capacities of the Japanese steel industry

(Thousand metric tons)

Facility	1960		1964	
	Yearend capacity	Units	Yearend capacity	Units
Blast furnaces	11,630	34	23,819	46
Open-hearth furnaces	11,747	143	16,327	151
Oxygen converters	4,843	13	[e] 18,000	36
Electric furnaces	7,744	626	11,333	771
Heavy shape mills	2,658	11	3,015	14
Medium and light shape mills	13,578	361	16,532	592
Wire rod mills	2,989	20	4,471	24
Heavy plate mills	5,140	31	6,517	38
Hot strip mills	6,996	7	15,900	11
Cold strip mills	3,929	26	8,116	43
Steel tube mills	3,193	173	3,859	187

[e] Estimate.

Source: Japan Metal Bulletin, Sangyo Press, Ltd. (Tokyo). Jan. 30, 1965, p. 3.

During 1964, Japan imported about 28 millions tons of iron, roughly two-thirds contained in iron ore, nearly a fifth in scrap, and the rest in pig iron. Special ore carriers enabled the country to acquire raw materials cheaply from distant sources. More than half of the iron ore came from nearby Asian countries, headed by Malaysia and India (including Goa), and most of the rest from the Americas, mainly Chile and Peru; two-thirds of the scrap originated from the United States; and three-fifths of the pig iron came from the U.S.S.R. and mainland China. Coking coal imports rose by 2 million tons over those of 1963, with the increment mostly imported from Australia rather than the United States, long the leading supplier.

The most significant news concerning acquisition of steelmaking raw materials was an agreement made in late 1964 between a consortium of seven Japanese steel companies and Hamersley Iron Pty., Ltd., of Australia (60 percent owned by Conzinc Riotinto of Australia Ltd., subsidiary of Rio Tinto-Zinc Corp. Ltd. of London, and 40 percent by the Kaiser Steel Corp.) for the purchase of 65.55 million long tons of high-grade iron ore from Mount Tom Price in northwestern Australia. The agreement involving more than $600 million covers a 16-year period, with deliveries to begin in August 1966 at a price of f.o.b. $9.92 per dry long ton for fines ($9.66 for lumps and $7.66 for powdered) at the port of King Bay, 288 kilometers from the mine. This became Japan's largest iron ore purchase and the largest sale ever made by Australia.

Of Japan's total 1964 semifabricated steel output (including special steels), roughly one-fifth was exported. While domestic demand rose markedly, the one-fourth increase in exports over those of 1963 made Japan the world's leading exporter of steel. Direct exports of steel products in 1964 were equivalent to more than 8 million tons of crude steel, and indirect exports contained in finished products, such as ships and automobiles, contained possibly another 4 million tons. Overall, Japan imported about two-thirds of the iron materials needed for steel manufacture in 1964 and exported nearly one-third of the steel as steel and finished products, emphasizing the indispensable role of iron and steel trade in the steel economy.

Japan made significant technical improvements in all iron and steelmaking processes during 1964. Average coke ratio was nearing 500 kilograms per metric ton of pig iron, and average blast furnace productivity increased to 1.41 tons per cubic meter per day. More automated facilities were used in the material flow line between carriers and blast furnaces. Ore sizing, sintering, and pelletizing operations were intensified. About 63 percent of the ore used was high-grade, sintered, self-fluxing ore. High-pressure operations and fuel injection were increasingly applied in blast furnaces. During 1964, 3 additional furnaces were placed under high-pressure operations, and by yearend 41 blast furnaces were employing heavy oil injection. Injection of heavy oil mixed with coal slurry was tested at the Muroran Works. Best blast furnace productivity was achieved at a blast furnace of the Mizue Works (2.0 tons per cubic meter per day), Muroran Works No. 3 furnace (1.73 tons), and Yawata Works No. 1 furnace (1.67 tons).

By yearend 36 oxygen converters were in operation, including 9 added during 1964. The Japanese claim that their LD (Linz Donawitz) converters perform better than the best of Alpine Montan (Oesterreichisch-Alpine Montangesellschaft) of Austria, inventor of the process. An important improvement to the original process is the multihole oxygen lance; also, computer control was increasingly applied. The O.G. process (unburnt oxygen converter, carbon monoxide gas recovery process) was successfully introduced at the Tobata Works and the Wakayama Works. Performance of open-hearth furnaces was also improved, heat consumption per metric ton of ingot was raised to an average of nearly 700,000 kilocalories and ingot output to more than 20 tons per hour. In special steels, enlargement of electric furnaces and greater use of vacuum melting were pushed. Continuous casting was further investigated, with technical contracts signed with United States, Soviet, and Swiss firms. Rolling mill performance improved, and hot scarfing machines for removing surface defects were increasingly employed.

The big six steel companies—Yawata Iron and Steel Co., Ltd., Fuji Iron and Steel Co., Ltd., Nippon Steel Tube Co., Ltd., Kawasaki Steel Corp., Sumitomo Metal Industries, Ltd., and Kobe Steel Works, Ltd., in that order—continued to dominate the Japanese steel industry, providing about 90 percent of the pig iron and nearly three-fourths of the crude steel in 1964. Yawata Steel increased its capital to become the largest firm in Japan. Its Tobata Works No. 3 blast furnace (1,947 cubic meters) was producing 4,000 metric tons per day at yearend. Construction continued at the new Sakai Works (eventually a 3.5- to 4-million-ton integrated works) just south of Osaka, with the completion of a hot strip mill and partial completion of a 2,047-cubic-meter blast furnace and two 150-ton LD steel converters. Fuji Steel continued to expand the Nagoya Works of its affiliated firm, Tokai Iron and Steel Co., Ltd., which was scheduled to become a 6-million-ton integrated works in a few years; the first (3,500-ton) of five very large blast furnaces was placed in operation on September 5, 1964, and a 3-million-ton hot rolling mill was also placed in operation. Nippon Steel Tube made significant progress in building its new, large integrated Fukuyama Works, and disclosed studies on automatic blast furnace computer control techniques. At yearend 1964, Kawasaki Steel was about ready to start its No. 5 blast furnace (2,143 cubic meters, capable of producing 3,600 to 4,000 metric tons per day) at its Chiba Works near Tokyo; a new medium pipe mill was completed during the year. Sumitomo Metal began operating a new Sendzimer-type galvanizing line at its not yet completed 5-million-ton Wakayama Works in April and claimed the country's lowest coke ratio in blast furnace operations. Kobe Steel signed an agreement in September to merge with Amagasaki Steel Manufacturing Co., Ltd., by April 1965.

Ferroalloys, Ferroalloy Metals, and Their Ores.—Japan retained its prominent position in the production of ferrous metals for alloying during 1964, with total output of ferroalloys at about 550,000 metric tons, a considerable increase over the 1963 level. Although increased steel production raised demand for ferroalloys, the Japanese ferroalloy industry, comprising about 40 producing firms, was beset by difficulties. Much capacity had become obsolete. The export market had dwindled to less than 13,000 tons, and the steel industry was abandoning its paternalistic purchasing policy in ferroalloys. Increasing power costs were forcing the less efficient operations out of business. Some large plants such as the Shinminato Works of Nippon Steel Tube (Nippon Kokan) and certain specialized plants competed effectively. However, there was a trend towards merger of companies. For example, two of Japan's leading ferroalloy producers—Toho Denka K.K. and Nippon Denki Yakin (Nippon Electric Metallurgical Co., Ltd.)--merged in 1964.

The raw material base for supporting the Japanese ferroalloy industry remained weak. All the high-grade metallurgical chromite and manganese required had to be imported. Chromite was imported mainly from the Philippines and the U.S.S.R. and manganese from India. Japan continued to rely primarily on Climax Molybdenum Co. (United States) for molybdenum concentrate and upon various countries, primarily the Korea Tungsten Mining Co. Ltd. (South Korea), for tungsten concentrate. Almost all of the nickel ore, amounting to about 1.1 million wet metric tons in 1964, came from New Caledonia (mostly from Société Le Nickel).

The same Japanese firms producing ferroalloys also produced pure ferroalloy metals. Tekkosha K.K. occupied a commanding position in diversity as well as total tonnage in 1964, being the sole important producer of electrolytic manganese and chromium in Japan. Sumitomo Metal Mining Co., Ltd., and Shimura Kako (Shimura Chemical Industry Co., Ltd.) were the only two nickel metal producers; and Mitsubishi Metal Mining Co., Ltd., Tokyo Tungsten Co., Ltd., and Tokyo Shibaura Denki (Tokyo Shibaura Electric Co., Ltd.) controlled the metallic tungsten and molybdenum business. Most of the chromium, much of the manganese, and a little of the tungsten and molybdenum were exported, whereas all of the nickel was domestically consumed. During 1964, Japan produced 6,673 tons of nickel, 703 tons of tungsten, and perhaps 500 tons of chromium, 5,000 tons of manganese, and 150 tons of molybdenum.

Nonferrous Metals.[6]—Japan's nonferrous metals industry, which with the exception of aluminum has a much stronger raw material base than the steel industry, experienced a growth in 1964, which was notable but not as spectacular as the growth of the steel industry. However, world significance of the copper, lead-zinc, and aluminum industries was less than that of the steel industry. Japan has had to purchase nonferrous raw materials from many parts of the world to meet smelter requirements. In 1964, nonferrous imports totaled about $300 million or roughly half of the smelter output value. The protected base metals mining industry was being readied for more open world competition during 1964, with liberalization of imports.

Aluminum.—The nearly one-fifth rise in aluminum output in 1964 was brought about by increased demand, expanded capacity at existing plants, and new production at the Chiba plant of Showa Denko K.K. near Tokyo and the Naoetsu plant of Mitsubishi Chemical Industries Co., Ltd., in northern Niigata. The new Naoetsu plant, which has a capacity of about 30,000 tons per year (capacity to be doubled eventually) used Australian alumina exclusively. The first large shipments of Australian bauxite arrived during the year, heralding a new important source of raw material for Japan. The projected 1965 Japanese fiscal year aluminum output gives a good indication of the 1964 yearend capacities of the four aluminum companies: Nippon or Japan Light Metal Co., Ltd. (affiliated with ALCAN), 116,000 metric tons; Showa Denko, 75,000 tons; Sumitomo Chemical Industries Co., Ltd., 74,000 tons; and Mitsubishi Chemical, 40,000 tons. No definite information is available as to the plans of Nippon Light Metal to install a direct reduction plant.

Copper, Lead, and Zinc.—The trend towards greater imports of copper, lead, and zinc to meet rising demands continued in 1964. However, Japanese mining firms, which built their business initially on local ores, retained control of the overall raw materials supply and smelting activities. The Sumitomo enterprise, founded on the Besshi copper mine, the Mitsui enterprise, founded on the Kamioka lead-zinc mine, and the Nippon Mining enterprise, based on the Hitachi copper mine, together with a few other firms, not only managed the major domestic nonferrous mines and the much larger smelters but also various projects abroad.

The most important developments in mining during 1964 took place in the field of the metallurgically difficult-to-treat and complex "kuroko," or black ores, of northern Honshu, Japan. These ores, found in three subzones of varied composition, can average 2 to 3 percent copper, 5 to 20 percent combined lead-zinc, and much silver. The Dowa Mining Co., Ltd., Nippon Mining Co., Ltd., and Mitsubishi Metal Mining Co., Ltd., have been most active in prospecting and developing such ores. By 1963 about 25 million tons had been discovered. As a result of subsequent deep drilling by the Japanese Geological Survey and companies concerned, estimated ore reserves as of mid-1964 were raised to 60 million tons, with additional potential to be explored. The most extensive deposits were Matsumine (near Hanaoka) of Dowa and Shakanai of Nippon, where earlier discoveries were located at 150 to 200 meters in depth and later, more extensive discoveries were found at depths below 300 meters. Several new shafts were being sunk in 1964, and others are planned, so that sizable increases in base metal production from this area can be expected.

---

[6] Japan Metal Bulletin, the Sangyo Press, Ltd., Osaka, 1964–65.

Foreign copper, zinc, and lead concentrates were much more significant than those of domestic origin. During 1964, Japan imported in the form of concentrates about 170,000 metric tons of copper, 150,000 tons of zinc, and 40,000 tons of lead. Imports of copper and lead were at about the 1963 levels, and imports of zinc were twice as high as in 1963. A very significant development was the greatly increased import of the refined form of these base metals over 1963 imports, the increment for each was 40,000 to 60,000 tons. In terms of total metal, Japan imported about 400,000 tons of copper, 100,000 tons of lead, and 200,000 tons of zinc in 1964. Mitsubishi Metal, Mitsui Mining & Smelting, and Nippon Mining continued to import copper concentrates from the Philippines; from the Toledo, Sipalay and Bagacay, and Philex mines, respectively. Sumitomo Metal Mining Co., Ltd., started to receive large shipments of Bethlehem copper ore from Vancouver. Imports of zinc concentrates from Peru, the leading source for this material, nearly tripled the 1963 tonnage. The Japanese also purchased sizable amounts of base metals from Broken Hill Consolidated, Ltd. and Mount Isa Mines, Ltd., Australia.

Japan's nonferrous smelting facilities were further modernized and expanded during 1964. At yearend, total annual capacities were approximately 385,000 metric tons of electrolytic copper, 130,000 tons of lead (85 percent electrolytic and the rest Parkes), and 380,000 tons of refined zinc (62 percent electrolytic and the rest distilled). Production from the Nippon Mining copper refinery was the largest, but production from Mitsubishi Metal and Mitsui Smelting copper refineries in particular was increasing. Mitsui Smelting retained its dominant position in lead-zinc production, followed by Mitsubishi Metal, Toho Zinc Co. Ltd., and Nippon Mining.

Construction of a 60,000-ton-per-year copper refinery at Onahama in Fukushima north of Tokyo under Mitsubishi Metal—Dowa—Furukawa Magnesium Co., Ltd., auspices began during 1964. The refinery will smelt only imported concentrates. Toho Zinc's 65,000-ton Annaka zinc refinery and Nippon Mining's direct reduction converter copper plant at Hitachi were operated at capacity, and Mitsubishi Metal's Akita zinc refinery was scheduled to be expanded to 48,000 tons. In 1964, Mitsui Smelting increased the monthly capacities of its Hikoshima zinc plant by 1,000 tons and its Kamioka plant by 1,375 tons of zinc.

Mitsubishi Metal and Consolidated Mining and Smelting Corp. of Canada (COMINCO) made plans to establish a 3,000-ton-per-month lead smelter at Mitsubishi's Naoshima Works, with Mitsubishi furnishing 55 percent of the $5 to $10 million capital and 770 tons of lead concentrates per month and COMINCO the rest of the capital and 3,300 tons of lead concentrates per month from its subsidiary, the Pine Point Mining Co. of Canada, under a 10-year contract.

In July 1964, the Sumitomo ISP Co. was formed with a view to using the Imperial Smelting Process to smelt ores supplied by the

Rio Tinto-Zinc Corporation and possibly also the "black ores" from northern Honshu. The new company was scheduled to begin production of 1,500 tons of lead and 3,000 tons of zinc monthly beginning January 1966, at a new plant near Kobe in Hyogo Prefecture. If successful, this will represent a major technological breakthrough. Mitsui Smelting was considering constructing an Imperial Smelting Process plant of similar size in Hachinoe, northeastern Honshu; decision to build the proposed $17.8 million plant will depend upon further investigation of the Huanzala mine in Peru, the projected principal source of raw materials. Meanwhile, Mitsui Smelting was also investigating a process representing "a step forward from the Imperial Smelting Process" with a view to treating Japanese "black ores."

Titanium and Magnesium.—The Japanese titanium industry increased its output in 1964 by 70 percent over that of 1963 to nearly 3,000 metric tons. Osaka Titanium Co., Ltd., which apparently operated all of its 10 furnaces in 1964, was planning to increase its annual production to 2,400 tons by the end of March 1965. Toho Titanium Co., Ltd., the only other Japanese producer of sponge, was making plans to produce at an annual rate of 3,000 tons by yearend 1965. Although the export market had grown, rising domestic consumption was the main factor, particularly the use of titanium by the petrochemical industry. Much work was also done by Kobe Steel to promote the utilization of titanium.

The titanium industry, in employing the Kroll Process, helped the magnesium industry to increase production through the use of magnesium (recycled) to reduce titanium tetrachloride. Furukawa Magnesium Co., Ltd., the lone Japanese producer of the metal, foreseeing expanding markets in aluminum alloying, titanium smelting, and ductile iron casting, made plans to increase its annual capacity from 3,000 to 5,000 tons. Dolomite was used as the raw material for making magnesium, and about 20 furnace units with approximately 300 retorts were operated by Furukawa in 1964.

Lesser and Minor Metals.—To meet the demands of its advanced industrial economy, Japan produced or consumed a great variety and sizeable tonnages of other metals in 1964. Some were byproducts of smelting, and quite a few were mainly supported by indigenous raw materials. The Japanese continued to produce many superpure metals. Lesser metals produced that are important by world standards included bismuth, cadmium, and selenium, with Japan producing 8 to 16 percent of the world total of each.

Bismuth was extracted at lead and copper smelters, mainly by Sumitomo Metal Mining and Mitsui Smelting. Half of the bismuth was exported, mainly to the United Kingdom. Cadmium was produced at the zinc refineries, with about 30 percent of the 1964 output exported. Less than one-tenth of the tin and mercury supplies were from domestic ores, with the rest mainly imported as metal. The Ishihara Sangyo Industrial Co., Ltd., completed a 750- to 1,000-ton-per-month tin smelter near Kuala Lumpur in mid-1964 to give Japan more direct access to Malaysian tin. A "finance and import" proposal to develop a 350,000-ton, 4.6-percent grade antimony deposit near Sydney, Australia, was made to the Japanese.

Japan produced significant quantities of gold and silver in 1964 as byproducts of nonferrous base metal smelting. The country was the third ranking producer of selenium. Zirconium production by Nippon Mining's Toda plant was suspended. Beryllium products were produced by Nippon Gaishi and Yokosawa Chemical, and tantalum powder was commercially extracted by seven companies. Mitsubishi Metal, Mitsui Smelting, and Nippon Mining produced tellurium. One small uranium deposit was worked in 1964. The best known high purity metal products were silicon and germanium. The country's electronic-grade silicon output in 1964, provided by six producers with a combined yearly capacity of about 17 metric tons, ranked second to the United States in the world. Germanium output staged a comeback in 1964 in its competition with silicon, registering a two-thirds increase over that of 1963.

NONMETALS

Cement.—Third-ranking producer of cement, Japan led West Germany but trailed the Soviet Union and the United States in output. It continued as the world's leading exporter of cement, the bulk going to nearby Southeast Asia. Exports were somewhat lower in 1964 at about 1.8 million tons; one former customer, South Korea, became self-sufficient in cement and stopped importing. Shipments to the Ryukyus and Singapore were expected to fall in 1965 with new local plants entering production.

Japan's cement industry has shown one of the world's highest growth rates, averaging about 10 percent annually for the past 5 years. Demand however was expected to taper off and, according to MITI, should average about 8 percent in the near future, reaching 37 million tons in 1965 and 52 million tons in 1970. These estimates include about 2 million tons of exports yearly.

As in the United States, declining market prices were hurting company profits, and overproduction loomed a serious problem. Plant expansions in 1963 cost an estimated $125 million, and investment continued in 1964 apparently unabated. Seeing a dangerous trend, the Japan Cement Producers Association and MITI tried to discourage further investment, when orders for cement began falling behind expectations. A growing tendency toward cutrate competition was noted, and products sold near costs. The wholesale price of cement dropped from $17.56 to $15.42 per ton during the year.

Japan's construction and roadbuilding continued to boom, but business began to feel effects of tightened credit toward the end of the year. Building starts were running well ahead of the previous year, at least at the 7-month mark, with major increases in the mining and manufacturing category. It was hoped that public construction would make up for any coming slack in private building. Cement capacity reached 43.3 million tons on April 1, 1964, 20 percent higher than a year earlier, but operating rates had fallen from 79.4 to 71.3 percent of capacity.

Major producers, Onoda Cement Co., Ltd., Nihon Cement Co., Ltd., Sumitomo Cement Co., Ltd., Osaka Cement Co., Ltd., Chichibu Cement Co., Ltd., and Ube Industries Ltd., accounted for nearly 70 percent of Japanese cement output. Onoda, one of the world's foremost cement companies, had 9 plants, 27 kilns, 5,200 employees, and a monthly capacity of about 740,000 tons. Overall, about 80 plants were operated by 24 companies, producing all types of cement. White cement production at 193,888 tons in 1964 comprised less than 0.6 percent of the total cement. Among major developments were plans for Sumitomo to acquire Wakayama Cement Co., Ltd., and add two 240,000-ton kilns; Mitsubishi Cement Co., Ltd., to install four 440,000-ton kilns; and Nihon Cement to add a 500,000-ton kiln. Chichibu and Mitsui & Co., Ltd., had further construction plans. Chichibu's new 120,000-ton wet-process Kumagaya plant, in Saitama Prefecture, was one of Japan's most efficient automatically controlled cement plants. Mitsubishi Heavy Industries, Ltd., installed two record-size 800,000-ton Lepol kilns at Nozawa Cement Co., Ltd.'s new Hikone cement plant. Stress on construction of larger, more efficient plants was indicative of the cost-price squeeze the Japanese industry was now going through.

Fertilizer and Chemical Materials.—Japan's fertilizer and chemical industries, with a strong resource base in some materials and hardly any in others, retained their prominent world position during 1964, producing 2.23 million metric tons of ammonium sulfate, 1.66 million tons of calcium superphosphate, 1.1 million tons of urea, 0.33 million tons of calcium cyanamide, and 3.24 million tons of compound or mixed fertilizers. The industry as a whole was considerably foreign-oriented, mainly to markets in the Far East. On the other hand, the basic chemical industry, which produced 5.37 million tons of sulfuric acid, 1.90 million tons of ammonium (NH_3 content in nitrogenous and mixed fertilizers), 0.73 million tons of soda ash, and 1.28 million tons of caustic soda, essentially supplied the domestic market in making fertilizers and for other uses.

Nitrogen was obtained mainly by fixation. Almost all of the sulfur and pyrite consumed was domestic in origin. Four-fifths of the total salt supply of 4.5 million tons was imported in 1964 from many sources but principally from Mexico and mainland China. Domestic salt, mainly from Inland Sea salt farms and twice as costly as imported salt, was limited by government edict to 0.9 million tons. Japan was virtually totally dependent upon foreign potash and phosphate rock, importing over 1 million and 2.3 million tons, respectively, with potash mainly coming from western United States, Canada, and the U.S.S.R. and phosphate rock from the United States (Florida).

More than 850,000 tons or 38 percent of the ammonium sulfate produced in 1964 was exported, considerably less than in 1963. To improve their competitive position and expand exports, at least 13 of 22 Japanese ammonia producers with 27 plants planned expansions totaling about 70 percent of current capacity. A steam-reforming process developed by the Imperial Chemical Industries, Ltd., promised significant cost savings. Strength of foreign demand was indicated by a 3-year contract with mainland China for annual shipments of 1 million tons of ammonium sulfate and urea and a similar agreement with South Korea for 0.7 million tons yearly. Rising Soviet purchases of Japanese fertilizers were also anticipated. Mitsui & Co., Ltd., Japan's foremost trading company, handled one-fourth of the ammonium sulfate exports, and two-fifths of the urea exports, one-fifth of the potash imports, and two-fifths of the phosphate rock imports during 1964. Japan, which had sold fertilizer plants to mainland China, concluded an agreement during 1964 to sell a $9.1 million urea plant to the Soviet Union.

The sulfur and pyrite industry of Japan[7] increased production considerably, particularly in elemental sulfur. The Yanahara pyrite mine of Dowa Mining maintained its dominant position, and Matsuo Sulfur Co., Ltd., remained the principal elemental sulfur producer as well as an important supplier of mixed sulfur-pyrite ore to sulfuric acid plants. Of Japan's total elemental sulfur output, about 7 percent (18,744 tons) came from oil refineries. Waste gases from oil refineries also provided sulfur for making sulfuric acid. Waste sulfuric acid and other wastes were being increasingly converted to byproduct ammonium sulfate. The great demand for elemental sulfur resulted in a rise in imports to nearly 8 percent of the 1964 supply; such imported sulfur costs half as much as indigenous sulfur produced by a "protected" industry. The equivalent of about 1.7 million tons of recoverable sulfur was produced from pyrite, pyrrhotite, cupriferous pyrite, mixed sulfur-pyrite ore, and other base metal sulfides in 1964. Almost all of the pyrite was used for the sulfur in making sulfuric acid (half of which in turn is used to make fertilizers), and much of the pyrite cinder left over was subsequently sintered for use as a primary iron material.

Other Nonmetals.—Limestone, one of Japan's most abundant and widespread mineral resources, was mined at about 430 locations. The rise in output paralleled that of cement which consumed 70 percent of the limestone. Local low-grade gypsum, mainly from some 30 producers in northern Honshu, also was used in cement; however, imports of supplementary high-grade gypsum from Egypt, Australia, and Mexico were necessary. Japan produced outstanding quantities of pyrophyllite, a talc substitute associated with clays, and feldspar for ceramics and fluxing. Barite was produced in adequate quantities, and the perlite and expanded-shale industries were being expanded. Domestic asbestos production remained at low levels, whereas imports (mainly from Canada) rose by one-fourth over those of 1963 to meet the increasing demand. Fluorspar, a material important for making steel and aluminum but only sparsely available locally, was imported in 60 percent greater quantity, with mainland China's contribution almost tripling. Production of dolomite increased and imports of magnesia clinker declined as greater use was made of dolomite-based refractories.

MINERAL FUELS

Coal.—Japan's 1964 coal output was slightly lower than in 1963 and considerably short of the MITI projection figure. Reduced production was largely the result of the accelerated closing of less efficient mines, the slowness in boosting production from the better mines, and the Miike mine disaster in late 1963, the worst in Japan's history. A shortage of coal developed, accentuated by increased demand by the electric power and iron and steel industries. The gap in domestic coal supply was filled by increased coal imports and substitution of liquid fuels.

---

[7] Sulphur (London). Elemental Sulphur in Japan: Growing Emphasis on Recovered Sulphur. No. 54, October 1964, pp. 16–22.

Japanese coal reserves, primarily from Kyushu and Hokkaido, were estimated at 21.2 billion tons in 1964, but much is difficult to recover and costly to mine. In fact about one-fifth of Japan's coal output comes from undersea workings. Unfavorable occurrence conditions explain the productivity of only 1.35 metric tons of coal per manshift in 1964, less than one-tenth of the average U.S. rate. Shortage of coking coal has also been a basic deficiency. Shutdown of numerous small and dangerous mines has aggravated the social problems of employment dislocations.

In an effort to improve conditions of the industry, the Japanese Government appointed a Coal Mining Investigation Commission in 1964 to make a thorough study and prepare proposals to stimulate the industry and stabilize it by 1972. One proposal in the Commission's report called for an increase in coal prices to maintain a minimum annual production rate of 52 million tons.[8] Other proposals included the establishment of a joint sales system to maintain prices, a 3-percent government subsidy to help some mines pay interest on old debts, special financial aid to mines in weak financial position, and provision of funds for technological and social improvements.

In the technical area, the shaft-sinking program continued and good results were achieved in coal blending and utilization. There was a definite trend towards the increased use of hydraulic mining, now primarily confined to coal mines in Hokkaido. For example, at the Ponki mine, Meiji Mining Co. Ltd., had met considerable success with hydraulic methods. About half a dozen other companies were also employing hydraulic mining or investigating its possibilities. Attention was focused on slurry transport of coal from the Ishikari coalfield to the port of Tomakomai in Hokkaido, with the hope that transportation charges for about 13 million tons of Hokkaido coal shipped annually to Honshu can be substantially reduced. While the system was deemed feasible, certain financial and technical problems were still unresolved.

Japanese coal consumption was expected to rise, judging from the expansion plans of the electric power and steel industries which consumed roughly 40 of the 70 million tons of Japanese supply in 1964. The power industry expects to require 30 million tons of coal by 1972, compared with 21 million tons consumed in 1964. Likewise, the steel industry is expected to use at least one-third more coal by 1970.

Although substantial quantities of foreign steam coal might be needed in the future, the most glaring deficiency has been and will probably be in the supply of coking coal. Australia supplied more such coal to Japan than the United States in 1964, and may well supplant the United States as the leading supplier in the next 5 years. In late 1964, Australian coal producers (some with American capital) and Japanese steel and public utility officials negotiated the sale of 30 million tons of coking coal from Moura, Queensland, to be delivered between 1965 and 1977. U.S. coals, though more expensive than Australian and other imported coals, are of better grade and more suitable for blending with the weakly coking coals of Japan. In the spring of 1964, Yawata Steel concluded a long-term contract with the U.S. firm, Eastern Associated Coal Corporation, for the purchase of 840,000 tons of high-grade coal annually over the next 5 years. Canada, the Soviet Union, and mainland China were also hoping for greater shares of the Japanese coal import market. An agreement was signed in 1964 to obtain at least half a million tons of Chinese coal annually. Japan imported about 0.4 million tons of anthracite from North Viet-Nam's Hongay field in 1964.

---

[8] Takita, K. Coal: Health by 1967? Far Eastern Econ. Rev. (Hong Kong), v. 47, No. 2, Jan. 14, 1965, p. 62.

Petroleum and Natural Gas.—Japan's domestic petroleum production in 1964, was, even more than in the past years, overshadowed by oil imports which were valued at about $1,000 million or one-eighth of all imports. Crude oil imports increased 80 million barrels, and fuel oil imports rose by nearly 9 million barrels, compared with those of 1963. Total imports, a fair gage of consumption, reached about 530 million barrels, compared with the less than 5 million barrels produced. The country's per capita oil consumption in 1964 was of about the same order as that of the Soviet Union.

Japan was a prominent consumer of petroleum products and a major refiner of crude oil. Refining capacity already installed ranks second only to that of the United States in the free world. An allied petrochemical industry, in full-fledged operation only since 1958, was expanded greatly in 1963–64.

In 1964, three-fifths of the primary energy consumed in Japan was oil and one-third was coal, continuing a trend of several years' duration. To meet the changing situation, regulatory measures have been enforced to moderate refinery expansion, apportion oil markets, and set up standard prices. The international nature of the Japanese oil industry also required surveillance so as to balance oil industry and national interests. Necessary adjustments to liberalization of crude oil imports were successfully achieved. To assist the domestic coal and oil industries, the Japanese Government has been collecting 28.3 cents per barrel on crude oil imports, exempting only the crude oil used in making city gas and fertilizers.

Most crude oil imports came through international oil companies operating in Japan or through direct purchases, with the Near East furnishing more than four-fifths of the total. Kuwait, Iran, and Saudi Arabia were the principal suppliers in 1964. The Khafji offshore field in the Kuwait-Saudi Arabia Neutral Zone, run by the Japanese firm, Arabian Oil Co., Ltd., provided 63 million barrels to Japan or nearly 14 percent of all crude oil imports. The high sulfur content of this oil was, however, a cause of technical difficulty. Japanese efforts to develop oil in northern Sumatra met with far less success.

During 1964, 19 refining companies with 35 refineries were in operation in Japan with a total rated output of 1.7 to 1.8 million barrels per day. Big non-Japanese petroleum firms like California Texas Oil Corp. (Caltex), Esso Standard Eastern, Inc. (Esso), Mobil Oil Co., (Socony-Mobil), Tidewater Oil Co., Royal Dutch Shell, Anglo-Saxon Petroleum Co. (British Petroleum), and Union Oil Company of California owned large shares of Japanese oil companies, including many sales companies. This group, with their own crude oil supplies, controlled about two-thirds of Japan's 1964 refining capacity. The rest was in the hands of about seven Japanese firms, headed by Idemitsu Kosan Co., Ltd., Maruzen Oil Co., Ltd., Daikyo Oil Co., Ltd., and Nippon Mining. There has been constant jockeying for the right to build additional refinery capacity to meet the forecasted Japanese oil demand of 3 million barrels per day by 1970. MITI was and will be responsible for reviewing applications for new refineries. Since Japanese financial resources were and will continue to be short, foreign capital, particularly U.S. capital, must play an important role.

The Japanese refining industry continued to be in a state of confused rapid expansion, with new investments in 1964 totaling about $270 million and an added capacity of 20 percent over that of 1963. The general expansion was slowed down by the June 1964 earthquake that brought devastation to Niigata City, the country's leading oil refining center, causing serious damage to three refineries. However, reconstruction commenced immediately after the disaster. One of these plants, the Niigata, owned by Showa Sekiyu Oil Co., Ltd., was being rebuilt at a capacity of 40,000 barrels of crude oil daily and was scheduled for operation in 1965.

Two new refineries began operating in 1964: Ohita, in Tsurusaki-shi, owned by Kyushu Oil Co., Ltd., rated at 40,000 barrels daily, with throughput topper, reforming-unifiner-platformer (UOP-type), and LPG plant; and Owase, owned by Toho Oil Co., Ltd., also with a capacity of 40,000 barrels. New developments were also reported for the following existing refineries: The Hakodate refinery (in Hokkaido) of Asia Sekiyu Co., Ltd., placed a 33-ton-per-day LPG plant on stream; the Yokkaichi refinery (in Mie Prefecture) of Daikyo Oil added a second benzene ketone dewaxing plant (1,800 barrels daily), a lubricating oil hydrorefining plant (Esso type) (3,000 barrels daily), and a 175-ton-per-day LPG plant in August 1964; the Mizushima refinery (Okayama Prefecture) of Mitsubishi Oil Co., Ltd., commissioned the 5,100-barrel-per-day No. 4 unifiner-platformer (UOP-type) in May 1964; and the Negishi refinery (in Yokohama) of Nippon Oil installed a 110,000-barrel-per-day throughput topper and a 13,000-barrel reforming-unifiner-platformer.

The domestic oil industry made very little progress in 1964. In fact, crude oil output dropped 14 percent compared with 1963, and natural gas production rose by less than 4 percent. Producing wells numbered about 3,000, a decrease of 10 percent from the previous year. Oilfield pressures showed a drop, and new wells drilled also declined. Despite unfavorable conditions, the Japanese Government continued efforts to strengthen Japan's meager oil base as part of the overall energy policy. Domestic oil and gas operations were almost exclusively run by the Government-controlled Japan Petroleum Exploration Co. (Japex) and the presently privately owned Teikoku Oil Co., Ltd. Through tariff policy and financing, the Japanese Government continued to support these two companies either directly or indirectly.

The Mineral Industry of North Korea

By J. M. West[1]

◆

NORTH KOREA produced $440 million worth of mineral products in 1964. Among Far East nations it ranked about equal with Indonesia and was behind mainland China and Japan. With 11 million people, North Korea had a per capita mineral and metal output value nearly equal to Japan's. The country stood among the first five in world output of tungsten concentrates, graphite, and magnesite, with about 7 to 11 percent each. It also was prominent in lead, zinc, pyrite, and barite production, providing 2 to 3 percent of the world totals of each. Other significant products included coal, cement, iron ore, pig iron, bismuth, cadmium, copper, gold, fluorspar, phosphate, salt, and talc.

The bulk of the minerals continued to be processed in domestic metallurgical industries, where technology was moderately well advanced, although fabrication facilities continued to show weakness. Exports remained important, particularly lead, tungsten, zinc, barite, fluorspar, graphite, magnesia clinker, and talc. Steelmaking lagged somewhat behind iron ore and pig iron production, leading to exports of these commodities in recent years. North Korea's lack of petroleum resources, in contrast to its good coal resources, has led to emphasis on development of coal as fuel and as the basis for chemical industries. Establishment of an aluminum industry was a prime goal. Increased outputs of nickel, cobalt, and rare and precious metals were also sought.

Progress appeared good in 1964 in most sectors of the mineral industry. Capital investment in mining was increased one-fourth in 1964 compared with 1963. A number of new mines were reportedly developed, and prospecting, tunneling, and concreting increased. Expansions took place at the Musan and several other iron mines. Kimchaek's output of steel was higher, indicating that improvements there were progressing satisfactorily. At the Hwanghae steel plant another blast furnace was under construction and a large rolling mill neared completion. Nonferrous metal production facilities were being modernized: Flotation plants were installed for pyrite and possibly copper at the Mandok mine, for copper-nickel ores at the Puyun mine, and for pyrite at the Songhung gold-silver-copper mine. A number of small-to-medium-sized metal and coal mines were opened, and another section was added to the Haeju cement plant. Several thermal and hydroelectric powerplants were under construction or reaching production stage, and railroad electrification increased. Fertilizer manufacture was emphasized, and several new plants were on order or being installed, mainly in connection with coal and metallurgical facilities.

---

[1] Physical scientist, Division of International Activities.

As an example of efforts to strengthen the mineral resource base, the North Korean mining industry reportedly obtained more than 60 excavators, over 300 air compressors, 390 winches, and more than 5,000 rock drills. Eighteen new metal mines, including the Panmun, Chongju, and Hwangchon, and 13 new coal mines, including the Sanghwa (Konpo) Hanpyong, Angha, Tongpo, Changpyong, and Pongchang, were developed. Increases in exploratory and developmental drilling and tunneling were reported. Indicated percent gains in 1964 follow: Exploratory drilling, 17; development drilling, 12; exploratory tunneling, 5; and development and extractive tunneling, 71.

GOVERNMENT POLICIES AND PROGRAMS[2]

The North Korean Government continued to give priority to developing the minerals industry as a basis for a strengthened economy. Its industrial output growth plan covering 1961–67 was claimed to be slightly overfulfilled for 1964, indicating significant overall gains. Among apparently successful enterprises were electric power, iron ore, coal, and iron and steel developments.

Efforts were concentrated on consolidation of mine operations and higher efficiency in the mining industry, with stress on larger equipment, more permanent installations, better ground support, and mine development farther in advance of extraction. The Government urged more extensive geological surveys, development of new mines, and expansion of fertilizer and cement facilities. Except for oil, the country's resource base was quite strong, particularly with regard to power, with a well developed hydroelectric system and sizable reserves of coal. Policy has been to use domestic resources within the country whenever practical, but to export whatever can be marketed advantageously abroad.

Government electric power and transportation programs were making progress. The 260,000-kilowatt Kanggye Youth Power Station (hydroelectric) and a thermal powerplant at Pyongyang were due to begin operations in 1964, the 400,000-kilowatt Unbong powerplant was under construction, and work was underway on several smaller plants including Kumgangson (Mount Diamond), Chogwang, and Taejong. Railway electrification projects were completed on the Pyongyang-Sinupku and Sinbukchong-Hongwon lines, and work neared completion on the Chongjin-Najin line, raising electrified trackage to nearly one-fifth of the total. Efforts were being made to increase rural electrification.

PRODUCTION

Rising steadily in recent years, North Korean mineral output in 1964 was valued at an estimated $440 million, approximately 10 percent above the 1963 figure. There was reportedly a 10.7-percent rise in total industrial production value. At midyear the General Bureau of Mining reported progress 3 percent ahead of plan, whereas the

---

[2] Democratic People's Republic of Korea State Planning Commission. [Results of the Fulfillment of the 1964 Plan for the Development of the National Economy.] Report of the Central Statistical Board, Jan. 15, 1965, pp. 1–4.

Ministry of Electric and Coal Industry was 2 percent behind. The main increases in the first half of 1964 came from pig iron and granulated iron, steel, coal, and cement. Nonferrous metals rose only about 2 percent, fertilizers apparently plunged 11 percent, but this reported decline may indicate simply a change in reporting system. Electric power output in the first half of 1964 was 2 to 3 percent higher than in the corresponding 1963 period, probably due to startup on schedule of a new powerplant at Kanggye.

Coal production, estimated 10 percent above the 1963 figure, accounted for about one-third of the total mineral output value, with iron and steel next in importance, followed by cement, nonferrous metals, and various nonmetals. Generally, output levels were slightly less than called for in the 7-year plan. Gains continued to be made in the country's moderately well-balanced and diversified metal processing facilities.

TABLE 1.—North Korea: Production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity [2]	1960	1961	1962	1963	1964
Metals:					
Cadmium, electrolytic	50	80	90	100	100
Copper:					
Mine	6,000	6,000	8,000	8,000	10,000
Electrolytic	8,200	8,000	10,000	10,000	10,000
Gold troy ounces	160,000	160,000	160,000	160,000	160,000
Iron and steel:					
Iron ore [3] thousand tons	3,108	3,550	3,340	3,860	4,800
Pig iron [4] do	853	930	1,213	1,159	1,340
Steel ingot do	641	776	1,050	1,022	1,140
Rolled steel do	474	536	633	762	950
Ferroalloys do	17	20	25	25	30
Lead:					
Mine	50,000	50,000	50,000	50,000	50,000
Smelter, primary	30,000	40,000	40,000	40,000	40,000
Nickel, electrolytic	300	400	400	400	500
Silver troy ounces	500,000	640,000	640,000	640,000	640,000
Tungsten concentrate	5,000	5,000	4,000	4,000	4,000
Zinc:					
Mine	85,000	90,000	90,000	100,000	100,000
Electrolytic	50,000	60,000	60,000	65,000	65,000
Nonmetals:					
Apatite	100,000	150,000	200,000	200,000	200,000
Barite	40,000	55,000	60,000	70,000	70,000
Cement thousand tons	2,285	2,262	2,376	2,530	2,610
Fluorspar	30,000	30,000	30,000	30,000	30,000
Graphite	62,000	65,000	65,000	70,000	70,000
Magnesite:					
Ore as mined thousand tons	50	200	500	800	900
Clinker do	20	100	200	385	400
Pyrite do	250	300	350	400	420
Salt do	324	392	421	450	400
Talc and soapstone	4,000	15,000	20,000	20,000	20,000
Mineral fuels:					
Coal:					
Anthracite do	6,778	7,500	9,000	9,700	11,200
Bituminous [5] do	3,524	4,000	4,000	4,000	4,000
Other do	318	290	200	340	300
Total do	10,620	11,790	13,200	14,040	15,500
Coke do	817	900	1,100	1,200	1,400

---

[1] All figures are estimated, except for iron and steel items (ferroalloy data available for 1960 only), cement, graphite (1960 only), magnesite (1963 only), salt (1960–62 only), coal (breakdown data available for 1960 only), and coke (1960 only). The firm figures are official North Korean data.

[2] Many other mineral commodities are produced, but reasonable output estimates cannot be made. These include antimony, beryl, bismuth, chrome, cobalt, manganese ore, mineral sands (ilmenite, zircon, columbite, rutile, monazite), minor and rare metals (selenium, tellurium, germanium, indium, silicon), molybdenite, alum, arsenopyrite, asbestos, boracite, clays, kaolin, lepidolite, limonite, mica (phlogopite), and silica (including glass sands).

[3] 1960–61 data apparently represent crude ore, most of which was 30 to 40 percent iron grade. 1962–63 data undoubtedly included some concentrates.

[4] Includes Krupp-Renn granulated iron or luppe.

[5] Low calorific value, much of which might be classified as low-rank coals.

TRADE

Roughly one-eighth of North Korea's total mineral and metal production in 1964 was exported, largely to Communist nations, particularly the Soviet Union and secondarily mainland China. Because of the lack of official North Korean trade data, imports of North Korean goods by the Soviet Union and Japan have been substituted as a measure of exports. Chinese statistics are lacking. Requirements for petroleum, one of North Korea's most important imports, are reflected by Soviet exports. Mainland China stands about third or fourth in North Korean trade. The trend in Chinese trade was indicated by an agreement, reported in September 1964, calling for exports to China of increased tonnages of coal, pig iron, steel products, chemicals, and other minerals in exchange for Chinese coking coal, oil, steel, and chemicals. Exports of lead and zinc concentrates to the U.S.S.R. apparently were declining because of expanded North Korean smelting operation. Pig iron, rolled steel, cement, barite, and magnesia clinker were also exported to the U.S.S.R. Japanese 1964 imports featured significant increases in North Korean iron ore, pig iron, zinc concentrates, and metallic zinc. Japan sold pipe, tinplate, and wire rope in exchange. Trade with the United Kingdom rose after signing of a contract in late 1963 for the exchange of British steel sheet for Korean lead and zinc.

TABLE 2.—North Korea: Exports of selected metals and minerals to the Soviet Union and Japan [1]

(Metric tons unless otherwise specified)

Commodity	Soviet Union		Japan		
	1962	1963	1962	1963	1964
Metals:					
Cadmium	NA	NA	[r] 10	15	21
Copper	400	----------	40	58	279
Iron and steel:					
Iron ore	----------	----------	500	26,399	351,463
Pig iron	47,300	75,200	16,187	89,031	147,014
Sponge iron	----------	----------	1,069	3,286	15,568
Granulated iron	----------	----------	523	4,035	15,922
Ferroalloys	1,700	1,700	----------	----------	----------
Rolled steel	56,900	64,900	----------	----------	----------
Lead:					
Concentrate	3,700	----------	----------	----------	----------
Metal	19,800	21,300	202	170	195
Silver troy ounces	----------	----------	65,850	39,700	48,330
Titanium ores	----------	----------	5,677	8,408	6,243
Zinc:					
Concentrate	42,200	36,200	1,418	----------	1,033
Metal	24,200	22,400	----------	214	7,839
Nonmetals:					
Barite	57,900	57,900	410	----------	1,918
Cement	161,000	193,000	----------	----------	----------
Fluorspar	NA	NA	4,105	2,972	5,698
Graphite	----------	----------	6,837	7,370	4,714
Magnesia clinker	67,300	87,500	21,118	10,637	13,567
Quartz and quartzite	----------	----------	776	1,752	1,919
Soapstone	NA	NA	4,583	2,124	2,793
Talc	11,900	12,000	1,011	2,619	3,230
Mineral fuels: Anthracite	----------	----------	6,043	13,627	33,095

[r] Revised. NA Not available.

[1] Derived from official import statistics of the Soviet Union and Japan available at time of writing.

TABLE 3.—North Korea: Imports of petroleum products from the Soviet Union [1]

(Metric tons)

Commodity	1962	1963	Commodity	1962	1963
Gasoline	179,900	238,300	Lubricating oil	47,600	38,000
Kerosine	7,900	4,900	Greases	900	2,100
Diesel fuel	191,700	162,200	Paraffin	1,600	1,500
Mazut (mainly fuel oil)	5,400	2,600			

[1] The U.S.S.R. is North Korea's main source of petroleum. Data are derived from official export statistics of the Soviet Union.

COMMODITY REVIEW

METALS

Iron Ore.—Iron ore production increased nearly 1 million tons in 1964, reflecting intensified development; specifically, new shafts were sunk at Musan, Unyul, Hasong, and Chaeryong. Musan, near the Manchurian border, was the country's largest iron ore producer, accounting for about two-fifths of all production; it supplied over 300,000 tons to Japanese markets in 1964, illustrative of North Korea's efforts to obtain foreign exchange by mineral exportation. Sales of concentrate containing 58 percent iron (dry basis) were reportedly contracted at a price of $7.35 per metric ton and valued in Japan at an average $10.07 c.i.f.

Musan's magnetite ores, containing 35 to 40 percent iron as mined, must be upgraded, as do most other North Korean iron ores. Construction was completed on a 560,000-ton concentrator at the Mandok magnetite-pyrite (and possibly with copper) property in Hamgyong Province, and a large new mill was in operation processing limonite ores at the Unyul mine near Pyongyang.

Iron and Steel.—North Korea's five major iron and steel centers, together producing more than 1 million tons of ingot steel in 1964, surpassed their record output of 1962 and the slightly lower 1963 level of production. Reports issued at midyear 1964 showed production of granulated iron (by the Krupp-Renn process using rotary kilns) to be 70,000 tons higher than in the corresponding period of 1963. Steel output in the first half of the year exceeded that of the first half of 1963 by 44,000 tons. An increased variety of structural steel shapes was being made, and plant efficiency was improved. Outputs of wire rope, seamless pipe, and thin plates were higher in 1964. A weak side of the industry was in finished steel products, especially uncoated and coated sheets, items that were being obtained by imports from Japan and the United Kingdom.

Steel plants were trying for better efficiency by providing hotter preheated air for blast furnaces, by improving oxygen intake of electric furnaces, by relying more on domestic coal, and by obtaining higher quality coal and iron ore. Consumptions of coke in pig iron production and of coal in granulated iron output were reportedly decreased 5 percent by operational improvements.

Hwanghae Steel Works, the major steel center south of Pyongyang, produced about 500,000 tons of pig iron and 400,000 tons of steel in 1963, and probably more in 1964. These were the approximate 1961 targets of the 7-year plan, indicating that progress was several years behind expectations. The plan calls for 1 million tons each of pig iron and steel by 1967. Equipment installed previously, including two 700-cubic-meter blast furnaces, a pair of recently installed 40-ton oxygen converters, open hearth and Bessemer electric furnaces, and several rolling lines, was augmented in 1964 with a 400,000-ton thin plate rolling mill. Hwanghae's No. 6 open hearth was said to need improvements to meet production schedules, and a third blast furnace apparently was under construction. Utilization rates increased 10 percent in blast furnaces, 3 percent in open hearths, and 2 percent in rotary furnaces.

At Kimchaek, on the east coast, where the rest of the country's pig iron was produced, the No. 2 blast furnace reportedly needed improvement. The first stage of converter steel installation was making headway. The Kangson steel mill became a little more efficient in 1964, and a new 50,000-metric-ton seamless pipe plant was placed in operation. The facility produces 6- to 150-millimeter pipe and was built with Rumanian help. Songjin, on the east coast, produced electric pig iron and special steels and had several rolling mills. Chongjin, to the northeast, produced granulated iron by the Krupp-Renn rotary process, using ores from Musan.

Zinc, Lead, and Copper.—Information on nonferrous metal mining was fragmentary, but reports of mill installations indicated that outputs should be rising. A concentrator capable of treating 400 to 800 tons of ore per day was completed at the Puyun nickel mine, and a pyrite flotation plant capable of producing 20,000 tons annually was installed at the country's largest gold-silver-copper mine, Songhung in South Pyongan Province. The Kapsan copper mine in Yanggang-do, with a mill of possibly 2-million-tons-per-year capacity, was expected to expand output.

Efforts were being made to modernize the nonferrous metal industry, especially with regard to zinc, lead, and copper facilities. There were probably small gains in production for these metals in 1964 but not the large increases foreseen by the regime. Exports of concentrates and metals continued to go chiefly to the U.S.S.R. in 1964; however, Japan received 7,839 tons of zinc metal.

The Munpyong lead-zinc smelter, with a zinc capacity of over 60,000 tons per year, was reportedly getting a Waelz kiln and sulfuric acid plant. Its ores came mainly from the Komdok, Kyesaeng, and Songchon mines. The west coast Namp'o copper-zinc smelter processed copper ores from the Huchang, Kapsan, Holtong, and Suan mines, and lead-zinc ores from the Nagyon and Ongjin mines. The Hungnam smelter, northwest of Munpyong, treated copper, gold, antimony, manganese, tungsten, molybdenum, and nickel ores.

Other Metals.—Gold and silver were largely byproducts of copper and lead-zinc operations, although a few mines produced mainly gold. At the Holtong gold-copper-scheelite mine in North Hwanghae Province, completion of a new main shaft and a mill with a capacity of 2,000 tons of ore per day was reported in 1964. The Inp'yong mine produced antimony ores, smelted at Hungnam. Cadmium and bismuth were significant byproducts from lead-zinc refining. Heavy mineral sands were produced; tungsten came mainly from two mines, Sinp'yong and Taehung. There were plans to produce some mercury in 1964, but the mine source was undisclosed. Having adequate electrical power, planners were considering producing aluminum from nephelite ores.

NONMETALS

Cement.—The cement industry continued expansion, the Haeju cement factory receiving another kiln. Production from about six plants throughout the country reportedly increased 80,000 tons in 1964, or about 3 percent. Gypsum for cement was imported from mainland China.

Chemicals and Fertilizers.—Chemical and fertilizer production was largely associated with metal smelting and coal facilities and based on sulfuric acid from pyrite and smelter gases. Hungnam and Namp'o both had superphosphate plants. Hungnam also produced sulfates and nitrates and was getting a 50,000-ton-per-year ammonia-from-coal plant (anthracite gasification). A similar plant was to be built at the Aoji lignite mine. More calciners and increased sulfuric acid output were proposed for Hungnam. Phosphorite or apatite was mined at Sinpung on the east coast and at Yongyu on the west coast. Lime-nitrogen fertilizers were gaining favor over ammonium chloride; the regime urged construction of 30,000- to 50,000-ton lime-nitrogen plants for the Ponkung Chemical Industry Management Bureau and Chongsu chemical complex. Increases were called for in calcium carbide production, rotary furnaces being favored for efficiency. A Netherland company was installing a 40-000-ton-per-year urea plant at Pyongyang. Purchase of 50,000 tons of mixed fertilizers from Japan on deferred payment terms was discussed, thus indicating North Korea's rising fertilizer needs.

Graphite.—North Korea, with one of the world's largest graphite reserve near Kanggye, produced mainly amorphous grade material but also some crystalline graphite.

Magnesite.—Magnesite, mainly from Yongyang in Hamgyong Province, and less from Namgye in Yanggang-do, was calcined in plants at Chongjin and Songjin. Sizable tonnages of clinker were exported.

MINERAL FUELS

Fuel and power outputs were higher in 1964; coal was estimated at 10 percent and electricity at 5 percent above the 1963 levels. Electric power was reportedly 627,000 megawatt-hours higher than the 11.8 million megawatt-hours in 1963. Petroleum products were used sparingly. Coal and wood were substituted wherever possible for oil, which must be imported. The Pyongyang thermal powerplant, under construction, was expected to use 1.4 million tons of coal annually, nearly one-tenth of total production. Hydroelectric power was also important.

Coal.—Coal output, although slightly below the 1964 target, increased, with a dozen or more additional mines placed in operation. A wet 1963 was blamed for the number of mines that fell behind plan. Anthracite, 80 percent produced on the west coast in P'yongan Province, was the most important coal. Large mines, such as the Sinchang and Kokonwon anthracite mines and the Anju and Aoji lignite mines, were being mechanized and improved. Coal scrapers were in use at Anju and Sinyuson. Heavier rails were being installed in some mines, and underground workings were being reinforced with concrete linings. Expansions at the Choyang and Hungnyong open pits were held up by equipment shortages and inadequate rail transport. Plans were made for future shafts at Aoji, Kokonwon, Kuktong, Nongpo, and Anju, but timber shortages posed a problem. Promising smaller mines, including Onsong, Dokchon, and Kangso, were to be expanded. More extensive development drifts were included in expansions at the Anju and Aoji mines. In Onsong-do, North Hangyong Province, 18 small-to-medium mines, including the Sanghwa, produced 140,000 tons of coal in 1964.

Bituminous coals, chiefly low rank, were produced at about the same levels as in 1963. Better grade coking coals had to be imported from Manchuria. Anthracite was used in place of imported coals as much as possible to minimize such imports. North Korea depended on anthracite for thermal power, chemicals, and fertilizers; a coal-based synthetic resin and fiber industry was in an early stage of development.

The Mineral Industry of South Korea

By J. M. West[1]

◆

SOUTH KOREA with U.S. help continued efforts to build an industrial base to balance its agricultural economy. Of the gross national product estimated at $3.3 billion, about 5 to 6 percent was attributable to mineral industry. Coal, tungsten, and iron ore were the principal mineral products, followed by cement, iron and steel, and fertilizers. Besides producing anthracite, coal briquets, and a large part of the world's graphite (mostly low-grade), South Korea supplied about 10 percent of the world's tungsten, 5 percent of the bismuth, and several percent of the fluorspar in 1964. Except for the famous Sangdong tungsten mine and a sizable anthracite reserve, the country's mineral potential was not great. However, much interest was given to developing available resources through surveys and explorations by the Korean Geological Survey, the Korea Office of Minerals Exploration Program (KOMEP), and the U.S. Agency for International Development (AID). AID sponsored a highly successful program employing Mineral Industries Engineers, Inc. (Golden, Colo.) to map and evaluate a large number of deposits.

The AID program was also instrumental in bringing about numerous improvements to the Changhang smelter during 1964, including additional equipment for lead smelting and refining, gold cyanidation, and dust recovery facilities. KOMEP and AID supplied a variety of mining equipment—much of it war surplus—on easy terms to qualified mine operators and provided maintenance training as well.

Investment climate improved after measures were taken to stimulate export trade; these included devaluation of the won from 130 to 255 per $1, which took place on May 3.[2] Inflation continued through the year, forcing wholesale prices up one-fifth and boosting mineral costs. However, the trade balance position improved. Building construction was an important contributor to the growth rate which was about 7 percent.

During the year three cement plants came into operation, more than doubling cement capacity; South Korea's first oil refinery started operations at Ulsan using imported crude oil; the Changhang smelter was improved and arrangements made for ore supplies; and plans were made to construct several new fertilizer plants to reduce foreign exchange required for imports. The power outlook was improved by a new thermoelectric plant on the coast at Kamchon and by the near-completion of the Chunchon hydroelectric project.

---

[1] Physical scientist, Division of International Activities.

[2] U.S. Department of Commerce. Investment Factors in the Republic of Korea. Overseas Business Reports 64–58, June 1964, 16 pp.

———. Foreign Trade Regulations of the Republic of Korea. Overseas Business Reports 64–24, March 1964, 8 pp.

———. Korea—Imports Expected To Rebound After Sharp Drop in 1964; Investment Outlook Bright. International Commerce, v. 71, No. 3, Jan. 18, 1965, p. 36.

GOVERNMENT POLICIES AND PROGRAMS

Midway through the Government's 1962–66, 5-year plan, the mineral industry had made significant gains in production; coal and cement were notably well ahead of production plans. U.S. AID support was necessary to maintain essential imports, to help stabilize the economy, and to further industrial expansion. Government attention focused on promotion of exports through subsidies, loan guarantees, tax exemptions, and priorities for materials. After currency devaluation in May, the export-import link system was abolished, and import licensing was liberalized under Bank of Korea control. In 1965 the Government planned to change from direct export subsidy to a system of subsidizing production of export goods. Another incentive, lowered interest rate, was planned for export loans.

Negotiations to normalize relations with Japan which had been delayed by public protests were resumed at yearend. A $20 million loan agreement was signed with Japan in December to supply raw materials and machinery for South Korean export industries. The Government also tried to get Japan to exempt from import duties goods produced in South Korea from Japanese materials processed in bond.

Major industries, such as electric power, steel, petroleum, railroads, coal, tungsten, and fertilizers, were dominated by government-owned enterprises, and proposals were made during the year to denationalize some of these. The Korean National Railroad's purchase of 65 more diesel engines from the United States resulted in decreased use of coal by the railroads, but rising electrical power and other needs for coal compensated for this loss of market.

Shortages of electric power were being alleviated, although costs and services were still not completely satisfactory. The Pusan/Kamchon thermoelectric plant (132,000-kilowatts), dedicated in August, was a major addition. The plant is at tidewater and uses Korean anthracite brought in by barge. The 57,600-kilowatt Chunchon hydroelectric project on the North Han River, Kangwon Province, was scheduled for completion in 1965, and will boost total electric generating capacity to 600,000 kilowatts, one-third hydroelectric and the rest thermoelectric. Agreements were signed for other plants: An AID-financed 66,000-kilowatt thermoelectric plant at Kunsan that is planned to begin operations by 1967, and an 80,000-kilowatt hydroelectric plant on the Han River east of Seoul that will be financed by French loans amounting to $12.5 million. Following an increase in the price of coal, the Government in September announced a 50-percent increase in electric rates to be more consistent with costs. Special rates, though, could be granted to export industries and to off-peak users.

PRODUCTION

The value of mineral output rose by an estimated $15 million in 1964, about 10 percent over that of 1963. The greatest increases were in cement and coal. Iron ore, lead, zinc, and fluorspar production also rose, but production of tungsten decreased despite better prices, about one-third higher than in 1963. Overall metallurgical output value was low, owing to poorly developed ore supplies and limited industrial activity.

Coal, the leading product, accounted for 55 to 60 percent of the total output value, an increase of 7 percent over the 1963 level. Cement production increased sizably when three new plants were added to two existing ones, but output had to be cut back at yearend because of excessive stock buildup. Tungsten production failed to respond to improving world prices until the latter part of the year, but the outlook was good for 1965. Lead and zinc outputs, although not large, were double the 1963 amounts and probably will continue in an upward trend because of favorable prices and the new smelting facilities being constructed at Changhang. Copper, silver, and gold production dropped slightly during the installation of new processing and cyaniding equipment.

TABLE 1.—South Korea: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 [p]
Metals:					
Aluminum semimanufactures	4,507	6,650	7,310	7,272	6,720
Bismuth:					
Concentrate (30 to 45 percent bismuth)	480	505	534	528	NA
Metal (99 percent bismuth)	102	108	154	135	132
Copper:					
Ore (4 to 10 percent copper)	5,892	5,296	10,726	12,297	12,426
Electrolytical metal	1,010	1,321	2,210	2,379	2,810
Sheet	387	545	740	1,518	1,651
Gold troy ounces	65,814	84,105	107,880	90,093	75,778
Iron and steel:					
Iron ore and concentrate (45 to 57 percent iron) thousand tons	392	505	471	501	685
Pig iron do	14	9	-----	5	1
Steel ingots (mostly from scrap) do	50	66	148	160	162
Lead:					
Concentrate (50 percent lead)	1,837	1,750	2,825	3,834	6,735
Plate	145	270	299	585	926
Manganese ore (40 percent manganese)	1,380	1,377	1,002	4,155	4,312
Molybdenum concentrate (90 percent molybdenite)	82	59	138	130	223
Nickel ore (3 to 4 percent nickel)	-----	934	868	855	599
Silver troy ounces	329,649	460,341	412,812	443,977	404,447
Tungsten ore and concentrate (65 to 85 percent tungsten trioxide)	4,915	[r] 5,720	5,797	[r] 4,740	4,657
Zinc:					
Concentrate (50 percent zinc)	84	900	839	2,260	2,540
Oxide	2,346	2,441	2,208	2,568	3,130
Nonmetals:					
Asbestos	671	309	1,209	1,923	1,272
Barite (90 to 95 percent barium sulfate)	200	700	920	2,758	2,743
Cement thousand tons	431	523	790	778	1,242
Diatomite	2,400	1,804	688	1,694	37,223
Fluorspar (90 to 95 percent calcium fluoride)	18,900	27,932	32,970	39,785	56,397
Graphite:					
Amorphous (75 to 80 percent carbon)	91,631	88,489	183,879	337,985	262,382
Crystalline (74 to 87 percent carbon)	700	1,224	1,216	1,692	2,076
Kaolin	51,231	51,177	38,193	52,262	60,536
Limestone thousand tons	637	1,265	1,260	1,363	2,220
Monazite	12	[r] 25	-----	-----	-----
Pyrophyllite	6,600	23,985	18,112	31,811	46,158
Salt thousand tons	399	122	388	230	386
Silica sand [1] (95 percent silica)	5,881	[r] 4,238	21,153	[r] 16,363	49,718
Talc (30 percent magnesia)	15,979	21,674	28,368	32,393	43,900
Mineral fuels:					
Coal, anthracite thousand tons	5,350	5,884	7,444	8,859	9,662
Fuel briquets (anthracite-clay mix) do	2,908	4,000	4,953	3,452	5,976
Peat do	97	41	[e] 100	[e] 80	62
Petroleum: refinery products:[2]					
Gasoline thousand 42-gallon barrels	-----	-----	-----	-----	555
Solvent do	-----	-----	-----	-----	11
Kerosine do	-----	-----	-----	-----	316
Diesel oil do	-----	-----	-----	-----	1,150
Fuel oil do	-----	-----	-----	-----	2,644
Bunker "C" do	-----	-----	-----	-----	76
Total	-----	-----	-----	-----	4,752

[e] Estimate. NA Not available. [p] Preliminary. [r] Revised.

[1] Previously reported as quartzite.

[2] Production starting in March 1964 at Ulsan refinery, as reported by Korea Oil Corp.

TRADE

Exports and imports of mineral products comprised 20 to 25 percent of all trade. However, an overall export to import ratio of about 3 to 10 created a serious imbalance. Total mineral imports in 1964 nearly equaled in value the exports of all goods. Fertilizers, fuels, and iron and steel were the main imports; refined petroleum product imports declined and crude oil imports began when the Ulsan refinery began operations. Cement imports dropped because of rising domestic production. Bituminous coal continued to be imported from Australia, Taiwan, and Japan (total in 1964 estimated at 160,000 tons), and anthracite was exported to Japan (an estimated 250,000 tons). Fertilizer imports consisted mainly of ammonium sulfate and urea from Japan and phosphates from the United States; the total was close to $30 million for the year. Aluminum ingots were imported from Taiwan and gypsum from Mexico.

Most trade was with the United States and Japan. U.S. AID imports were particularly important. Japan received over half of the mineral exports, including iron ore, coal, tungsten, and fluorspar. Tungsten concentrate exports in 1964 totaled 5,463 metric tons valued at $4,654,000, according to preliminary figures. In addition to Japan, tungsten concentrates were exported to the United Kingdom, Belgium, United States, and Netherlands. Steel imports had been cut sharply by trade restraints. Iron and steel exports continued to South Viet-Nam at a slackened pace.

A barter arrangement under discussion with Indonesia included Korean sheet glass and galvanized iron sheets. Trade conferences with the Philippines in late 1964 stressed exports of surplus Korean cement; an agreement with Burma included tin. During October and November 1964, the U.S. Commodity Credit Corporation tendered bids to supply $670,000 worth of zinc for the Korean AID program. Government officials reached agreement in December to permit import of industrial raw materials and equipment needed to support small to medium industries suffering from foreign exchange shortage. Further liberalization was discussed, and more clear-cut rules were sought for controlling imports.

TABLE 2.—South Korea: Exports of metals and minerals

(Metric tons)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum	81	107	Japan, 80.
Copper	40	----------	
Iron ore	363, 988	[r] 558, 648	Japan, 558,048.
Iron and steel	[1] 3, 034	[1] 70, 986	South Viet-Nam, 69,212.
Lead concentrate	1, 443	4, 982	Japan, 4,399; United States, 583.
Nickel ore	916	546	Japan, all.
Tungsten ore and concentrate	4,713	5,107	Netherlands, 998; United States, 929; Japan, 919; United Kingdom, 912.
Zinc concentrate	725	3, 144	Japan, 2,944; United States, 200.
Nonmetals:			
Barite	299	1, 688	Taiwan, 1,588.
Fluorspar	23, 611	31, 896	Japan, 30,820; Taiwan, 620; Philippines, 391.
Graphite	47, 379	47, 416	Japan, 44,449; Taiwan, 1,562.
Kaolin	7, 741	13, 845	Japan, 13,754.
Talc	18, 369	17, 570	Japan, all.
Mineral fuels: Anthracite coal	301, 487	262, 954	Japan, 262,153.

[r] Revised.

[1] Revised: 1963 exports included 46,663 metric tons, plates and sheets, nearly all to South Viet-Nam.

Source: Research Department, Bank of Korea, External Trade Statistics 4th Quarter 1963.

TABLE 3.—South Korea: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum	11,804	7,653	United States, 5,348; Taiwan, 937; Japan, 836.
Copper (including alloys)	826	[1] 517	
Iron and steel:			
Scrap	[r] 22,305	60,938	United States, 50, 368.
Ferroalloys	5,471	4,855	Taiwan, 2,682; Japan, 754.
Steel ingots	1,489	44,421	Japan, 38, 202.
Semimanufactures	[r] 168,339	[r] 279,409	Japan, 249, 940.
Lead	2,255	3,726	United States, 1,970; Mexico, 550; Australia, 532.
Mercury 76-pound flasks	725	NA	
Nickel	45	179	Japan, 150.
Tin long tons	313	215	United States, 102; Japan, 49.
Titanium oxide	1,312	983	United States; Japan.
Zinc	5,017	10,467	Japan, 2,841; United States, 2,072; Mexico 1,194.
Nonmetals:			
Asbestos	1,365	2,630	Canada, 1,617; Japan, 750.
Cement	180,385	274,294	Japan, 208,863; Taiwan, 64,030.
Fertilizers (manufactured):			
Ammonium Sulphate	612,435	609,652	Japan, 597,272.
Others (mainly phosphatic)	543,147	365,528	United States, 305,107; Japan, 60,376.
Total	1,155,582	975,180	Japan, 657,648; United States, 305,444.
Gypsum	22,093	29,972	Mexico, 21,317; United States, 6,155.
Magnesite	1,722	2,077	United States, 1,356; Japan, 561.
Sulfur and unroasted iron pyrites	6,203	10,907	United States, 6,968; Canada, 3,939.
Mineral fuels:			
Bituminous coal	180,018	[r] 133,652	Japan, 53,229; Australia, 44,672; Taiwan, 35,611.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	233	341	United States, 207; Japan, 134.
Refinery products:			
Gasoline [r] do	702	633	United States, all.
Kerosine do	390	402	Do.
Distillate fuel oil do	1,932	[r] 3,869	Do.
Residual fuel oil [r] do	3,794	4,173	Do.
Lubricants [r] do	93	237	Japan, 190.
Pitch and asphalt do	216	394	Japan, 265; Taiwan, 106.
Others [r] do	64	58	United States, 54.
Total [r]	7,191	9,766	United States, 9,090.

NA Not available. [r] Revised.

[1] Copper alloys only.

COMMODITY REVIEW

METALS

Iron Ore and Steel.—Although South Korea requested support to establish a commercially feasible process using domestic iron ores for integrated steelmaking, most of the raw material used in 1964 was scrap imported from the United States and ingots from Japan. Meanwhile more iron ore was mined and exported, all going to Japan. Yangyang iron mine, Kangwon Province, supplied more than half of the ore and produced at higher rates after completing a key haulageway. Ore loading facilities were installed at Sokcho. Search for iron ore continued under AID sponsorship, and preparations were made to explore a potentially important titaniferous magnetite deposit on Soyonpyong-do Island. Mining plans and cost estimates were formulated; Inchon Heavy Industries Co. cooperated in obtaining a

100-ton ore sample for tests. The Strategic-Udy Co. direct reduction process was being seriously considered, with suggested plant size of 100,000 metric tons per year. Ore samples from the Sosan and Choongjoo areas were sent to the United States for testing.

Steel ingot production was little changed in 1964 but more crude steel was imported and rolled in South Korean mills. Iron and steel imports (excluding scrap) totaled 154,223 tons in 1964 and were as follows, in metric tons: ferroalloys, 3,130; ingots and blooms, 25,611; wire and rods, 4,070; bars and shapes, 9,264; sheets and plates (mostly uncoated), 42,282; hoops and strips, 63,536; rails and accessories, 3,735; and tubes and pipes 2,595. Exports totaled 12,827 metric tons, all plates and sheets. Prospects for galvanized sheets in the South Viet-Namese market brought rising production late in the year.

Tungsten, Bismuth, and Molybdenum.—Tungsten production was slow to respond to higher prices. The synthetic scheelite plant, using soda-ash leach-treatment on middle-grade ores from accumulated stockpiles and operating at about 50 percent of capacity, produced about half of the total Sangdong tungsten output. Bismuth and molybdenum byproducts came mostly from the flotation plant. Korean Tungsten Mining Co. (Government controlled), operating the famous Sangdong mine, reported yearend mine stocks (included those of the Dalsung mine) at 467 metric tons of concentrates compared with 1,045 in 1963. Installation of a new hoist was considered; problems in process control were encountered at the mill. At Dalsung, an exploratory crosscut disclosed only sporadic sulfides in extremely leached rock. Bismuth concentrate was reduced to metal in a furnace at the Sangdong plant. The Changsu molybdenum plant (owned by Changsu mine operators) at Yongdungpo, near Seoul, treated Sangdong's low-grade filter cake and concentrates and obtained molybdenum in oxide form. Small quantities of tungsten and molybdenum ores were mined by private operators.

Other.—Gold, silver, and copper outputs were lower at the Changhang smelter, the only base metal refinery, but efforts were being made to obtain more uniform ore and to improve refining techniques. Operators faced the problem of determining suitable blends from the wide variety of ores that private mines supplied and needed speedier analytical results. Reconnaissance of a copper area in southeast Korea was aimed at increasing smelter ore supply. Electrolytic refining test results on poled copper anodes favored adoption of the poling step. Flue dust that was collected during spring cleanup at Changhang contained US$125,000 in precious metals and copper. The Kwangyang mine was an important source of gold-copper ore. Rehabilitation of Changhang's flotation mill was underway, and a new cyanide plant that was constructed to treat discharge tailings together with old high-gold-value tailings began recoveries.

Lead-zinc production was about double the 1963 level, spurred by higher metal prices and encouraged by a new roaster-sinter/lead-smelting unit completed at the Changhang smelter. Considerable interest was aroused in search for new deposits. The blast furnace was blown in, and the first bar of refined lead was cast in September, with about 40 tons cast during the remainder of the year. Efforts were made to remove bismuth and to produce high-purity lead. Byproduct sodium arsenate was made on a sample basis. The Je Sam Uk mine, an important orebody with complex ores, near Chonju, was under development and shipping to Changhang; plans were made to rework the old Shiehung tailings pond for zinc. Taejon Metallurgical Laboratory had temporary pilot-size mills operating at three mines: Dae Dong-A lead-zinc, Sam Dok molybdenum, and Kosung copper. Copper-zinc minerals were found during routine excavations at the Chinhae Naval Base, and geochemical methods were used in exploration at the promising Yeonhwa lead-zinc mine.

NONMETALS

Cement.—The Government program to encourage the use of cement in construction and thus conserve forest products resulted in three new plants starting prouction in 1964; cement output increased nearly half again over that of 1963. New plants (annual capacities in parentheses) were: Hanil Cement Co. (400,000 metric tons), near Tanyang, Chunchong-Pukdo; Tan Yang Cement Co. built by Hyun Dai Construction Co. (150,000 tons, with request filed for $2.5 million AID loan to expand to 300,000 to 400,000 tons), near Chechon; and Sangyong Cement Co. (400,000 tons), near Yongwol. Another cement plant will be built now that the Government has authorized C. Itoh & Co., Ltd. (Osaka), with other private Japanese financing to build a $5 million plant that will have a capacity of 350,000 tons. Two existing operations, Korea Cement Co., at Mungyong, and Tong Yang Cement Co. at Samchok (both about 360,000 tons per year), continued at capacity production. In addition, a 200,000-ton-per-year grinding plant owned by Daihan Cement Co. and using imported clinker, was reportedly in operation at Sobinggo, near Seoul, although there were difficulties with exchange allocations to bring in raw material.

The increase in cement capacity to about 1.9 million tons was an achievement of the nation's first 5-year plan, and rising production eliminated shortages that had allowed excessive profits and black market prices (dealers and manufacturers were assessed special taxes on their excess profits). As a result of sudden cement surplus in 1964, Korea's five manufacturers decided to form a cartel, Korean Cement Sales Co., to maintain profitability. The move brought criticism from the press but no official interference. At the same time the press criticized the U.S. forces in South Korean for importing cement from the United States at higher than local prices (reportedly $38.70 per ton c.i.f. compared with Korean cement at $17 per ton) when domestic plants were producing a surplus. The imports were explained as small and coming under military assistance program aid for which funds usually must be spent within the United States. With South Korea's expanded output, the United States considered turning over its cement procurement operations to the Korean Government.

Fertilizers.—Two Government-owned plants produced urea fertilizers in 1964: Chung-Ju Fertilizer Corp. (86,000 metric tons) and Honam Fertilizer Corp. (55,100 tons). Honam, West German-built, had production problems and operated below its 85,000-ton capacity. Fertilizer was one of South Korea's largest import items. All phosphatic fertilizer, about 140,000 metric tons of contained phosphorus pentoxide (P_2O_5) in 1964, was imported, and the 1965 requirement was expected to rise 10 to 15 percent. Nitrogenous requirements were about 170,000 tons in terms of elementary nitrogen. To meet the need, new plants were being constructed, but meanwhile large quantities—700,000 tons or more annually, primarily of ammonium sulfate—reportedly were ordered from Japan for 1965–67 in an agreement between the Korean Minister of Agriculture and Forestry and the Nippon Ammonium Sulfate Export Co. The Government, to counter increased costs caused by currency devaluation, subsidized fertilizer purchases from May until September 15 after which prices to farmers increased.

A consortium of U.S. companies including Gulf Oil Corp., Swift & Co., and Skelly Oil Co. considered plans to build two $40 million mixed fertilizer plants at Ulsan and Changhang. In June an agreement was signed on an equal share basis between Gulf Oil Corp. and the Government-owned Chung-Ju Fertilizer Corp., for a 144,000-metric-ton complex at Changhang; its target completion date was mid-1966. Chung-Ju also negotiated with foreign investors (including Mobil Oil Co.) who were interested in the Ulsan site. The Government position was undecided on the $42 million 330,000-ton urea plant at Ulsan for which provisional funds were to be secured from Mitsui & Co. (Japan); there were plans for marketing its output abroad under a 10-year contract with the U.S. firm International Ore Fertilizer Corp.

Other.—Fluorspar output was almost half again greater than in 1963; Dojon mine, in the Chonju area, produced 30 to 50 metric tons per day, and the Choongang fluorite mill operated south of Taejon. Amorphous graphite output decreased by half, but salt output doubled because of better drying weather in 1964. Limestone production increased because of expansion in the cement industry and because of greater use of limestone in agriculture. The Kwangchon asbestos mine produced an average of 80 tons per month of short fibers; Dongil talc mine was at a critical stage of development; the Sangsok pyrophyllite open pit produced 1,000 tons per month which was exported to Japan; Shi Heung Graphite Mining Co. (crystalline graphite) was operating; and there was activity at the Kyongju diatomaceous earth deposit.

MINERAL FUELS

Coal.—Coal mining was stimulated in the latter part of the year by removal of Government price ceilings, and output was estimated 7 percent higher than in 1963. Coal also benefited from the greatly increased electrical energy demand for mining and manufacturing. Private producers, supplying about half of the output, raised prices 30 percent in September; this increase created fears that coal briquets, important in home heating, would be even more costly. (Korean anthracite in general disintegrates rapidly, so much of it is briquetted for use). The 15-percent price rise initiated by the Government-owned Daihan Coal Corp. in November had a stabilizing influence. Electric rates increased as the price of coal increased, but this was deemed necessary to help pay off indebtedness. Coal exports to Japan continued to be sizable, and imports of bituminous coal were largely used for iron and steel manufacturing.

The U.S. firm Pierce Management Corp. studied Korean coal, supervised mining expansions, and forecast a 17-million-ton production level by 1975. The potential reserve was estimated to be nearly 325 million tons, about two-thirds in Government mines. The largest of these, Changsong, was being expanded and changing to shaft mining. The Federal Republic of Germany provided a loan to Daihan to raise production of five mines other than the Changsong mine, and as part of technical assistance training took a group of about 1,000 Korean miners on 3-year contracts to work in West Germany coal mines.

Petroleum.—South Korea's first oil refinery started operating in early 1964. This 35,000 barrel-per-day plant at Ulsan used crude oil imported from the Middle East and began to provide a sizable part of the products for commercial sales (nonmilitary). Product sales, estimated at 6.2 million barrels, lagged behind the 7.4 million barrels reported sold in 1963. Transport facilities were ill-prepared, and the plant, finished ahead of schedule, suffered transfer problems. Excess gasoline output found a market in the Philippines, but diesel fuel imports were necessary to cover shortruns. During October and November the plant was closed because of a platformer failure, and products had to be imported to cover production losses. Also the company had difficulty in obtaining Government release of foreign exchange to purchase crude supplies. Ulsan was expected to process 11.5 million barrels of crude oil annually. Gulf Oil Corp., a partner with 25-percent equity, held exclusive rights to supply crude oil for 15 years through terms of Gulf's $20 million loan fund, which was established to cover the Korean Government's share of construction and operation costs.

In May, the United States and South Korea signed a Petroleum Agreement covering importations for use of U.S. and U.N. forces. "Tax free" and "state of emergency" provisions were publicly criticized. Following the agreement, Korea Oil Co. prepared to absorb Korea Oil Storage Co. facilities and to consolidate production and distribution of petroleum products. A revised petroleum products tax law to become effective January 1, 1965, set a 100-percent tax on gasoline (this law, which has been in temporary effect since July 1964, reduced the gasoline tax rate from its former 300-percent rate), a 40-percent tax on diesel fuel, a 20-percent tax on heavy oil, and a 10-percent tax on other products (kerosine exempted).

The Mineral Industry of Malaysia[1]

By J. M. West[2]

⁂

FACED with the stresses of a developing nation and with the added strains of neighboring Indonesia's confrontation policy, Malaysia with its 11 Peninsular States, Singapore, Sarawak, and Sabah nevertheless thrived in 1964. Its traditional main industries—rubber, tin, and iron ore production—did well, and investments were pouring in to develop the country's industrial base.

As the foremost world tin producer, Malaysia supplied almost one-third of the world mine production and two-fifths of its refined metal output. It was second only to mainland China in the Far East for iron-ore production and supplied about 2 percent of the world bauxite. Malaysia also was of some importance as a refiner, trader, and consumer of petroleum. Brunei, the small relatively oil-rich independent state between Sarawak and Sabah, produced about 0.3 percent of the total world crude output.

Minerals contributed an estimated 10 percent of Malaysia's approximate $3 billion gross national product (GNP) in 1964. The GNP increased an estimated 5 percent annually in 1961–63 and probably about 7 percent in 1964; it reflected a healthy growth in both public and private sectors. More than 70 percent of the mineral component was provided by tin and the rest almost entirely by iron ore, cement, bauxite, and petroleum.

Price fluctuations in tin were watched with concern as U.S. stockpile releases continued at high levels in 1964. World demand, however, boosted tin prices to an average one-third higher than in 1963 and brought increased revenues to miners, smelters, and the Government. Because of questionable price stability, tin producers wanted to renew the International Tin Agreement whereby a measure of control had been achieved.

Although additional tin-mining areas were developed and operations were expanded during the year, production showed little gain; offshore deposits received more attention; and a new tin smelter at Klang went into operation. Malaysia's fifth oil refinery went on stream at Port Dickson and ground was broken at Singapore for the nation's sixth refinery. Cement capacity more than tripled to more than 1 million tons annually as two new cement plants started production in Malaya and one neared completion at Singapore. Steel and galvanizing facilities were under construction, and plans that called for a large investment in steel at Prai were expected to get government approval for go-ahead in 1965. Copper and chromite were under investigation in Sabah, and coal and offshore oil in Sarawak.[3] Malaysian minerals were reviewed.[4]

---

[1] Includes data on petroleum production of the Independent Sultanate of Brunei.
[2] Physical scientist, Division of International Activities.

GOVERNMENT POLICIES AND PROGRAMS

Malaysia's continuing relative stability and prosperity, coupled with a free-enterprise system and minimum Government controls, contributed to a favorable investment climate.[5] Government encouragement of private investment through its Economic Planning Unit, Malayan Industrial Development, Ltd., and other agencies continued; its pioneer industry program offered tax writeoffs and other inducements. Absence of restrictive regulations on ownership have provided incentive to many subsidiary and foreign-owned companies to establish Malaysian operations.

Tin remained a major concern of the Government, providing important tax income. The Government moved in 1964 to share the benefits of high tin prices by inserting a 6-percent excess-profits tax in its 1965 budget, but tin-mining companies campaigned unsuccessfully against adoption. In addition to a 40-percent net income tax and a payroll tax, tin was subject to a 16-percent ad valorem tax on gross sales of concentrates. While the Central Government helped in exploring State reservation lands for tin, the States retained the right to control mining. State law also governed offshore mining to the 3-mile limit. The States tried to encourage native Malayans to take part in mining State-reservation tin deposits but met with only limited success in an industry dominated for so long by Chinese and Europeans.

A comprehensive development plan was being composed for the whole of Malaysia to follow Malaya's second 5-year plan. Sarawak's own plan for 1964–68 included projects for development of coal, oil, ceramic clays, and gold. Indonesian insurgents were reported harassing remote and border areas, and there was no official trade with Indonesia, resulting particularly in lower tin trade and generally lagging Singapore entrepôt trade. Malaysia's Tariff Advisory Board began talks in late 1964 to establish nationwide tariffs; simultaneously import restrictions were imposed to prevent speculative stockpiling at free ports.

The Government program of establishing industrial estates was an eminent success. Nearly half of the Ipoh (Tasek) estate was allocated; demand for sites at Butterworth's Mak Madin estate was so great that developers were looking for additional land in nearby Penang. An estate project for heavy industries was started at Kamuntang. Such developments caused rapid expansion of power demands, and to keep up, the Central Electricity Board (CEB) placed an order for a $4 million, 60,000-kilowatt Japanese oil-fired powerplant to go into operation at Prai in mid-1966. A major event was the letting of the main contract for the 154,000-kilowatt Batang Padang hydroelectric project, scheduled to begin producing energy in 1968. This project will link up with the Cameron-Highlands project, which was partially completed. Perak River Hydro-Electric Power Co., Ltd., commissioned two 20,000-kilowatt thermal generators and planned to buy additional bulk power from the CEB. Peak loads reached 100,600 kilowatts in 1964. Four-fifths of the company output goes to tin mining. The Sarawak Government was building a $5 million power distribution system to tie in with new gas-powered thermal plants at Seria and Gadong.

---

[3] Geological Survey, Borneo Region, Malaysia. Annual Report, 1963, 230 pp.

[4] Cochrane, G. W. Mining and Minerals in Malaysia. Min. & Chem. Eng. Rev. (Australia), pt. 1, v. 56, No. 5, Feb. 15, 1965, pp. 33–39; pt. 2, 56, No. 6, Mar. 16, 1964, pp. 21–24.

[5] U.S. Department of Commerce. Establishing a Business in Malaysia. Overseas Business Reports 64–78, June 1964, 18 pp.

———. Basic Data on the Economy of Malaysia. Overseas Business Reports 64–25, March 1964, 24 pp.

PRODUCTION

Mineral output was valued at an estimated $310 million, nearly 25 percent higher than in 1963 owing mainly to increased tin prices. Tin and secondarily iron ore accounted for most of the value, with cement and bauxite as well as refined petroleum as other important products. Sarawak oil and bauxite provided about 5 percent of the output value. Sabah produced only small quantities of construction materials such as bricks and crushed stone for local use.

Tin concentrate output was about the same as in 1963, but tin metal production decreased considerably since Indonesian concentrates, formerly smelted in Penang, were being processed in Netherlands. Iron-ore production was 12 percent lower because of a decrease in Japanese purchases, and bauxite production was expected to decrease in 1965 because of gradual depletion of deposits. Ilmenite and monazite output and exports were lower because of consumer preference for output from other sources. The trend of increasing tin production appeared to be leveling out, with poor prospects for substantial increases, even with continued favorable prices because of declining grades. Sarawak's oil output continued to ebb but there was a chance for offshore discovery with probing underway. Brunei produced an estimated 3.5 million tons of crude oil in 1964.

TABLE 1.—Malaysia: Production of metals and minerals[1]

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Antimony ore (Sarawak)	---------	---------	---------	6	157
Bauxite:					
Malaya thousand tons	459	417	355	451	470
Sarawak do	289	257	229	157	168
Total do	748	674	584	608	638
Columbite-tantalite concentrate, columbium-tantalum ratio 4:1, 70 to 80 percent pentoxides	94	[e] 100	112	89	57
Copper, flotation concentrate	1,864	[e] 2,000	[e] 2,000	[e] 2,000	[e] 1,085
Gold:					
Malaya (crude) troy ounces	20,745	12,486	6,923	9,116	7,295
Sarawak (fine) do	3,326	4,132	2,885	2,773	3,115
Iron ore, 60 to 64 percent iron thousand tons	5,731	6,842	6,612	7,381	6,569
Manganese ore, 30 to 40 percent manganese	2,923	6,468	309	6,982	---------
Tin:					
Mine (contained 75 to 76 percent tin concentrate) long tons	51,979	56,028	58,603	59,947	60,004
Smelter [2] do	76,130	79,114	82,073	84,001	71,351
Titanium concentrate (ilmenite; exports)	119,980	108,585	103,289	149,366	131,313
Tungsten ore and concentrate (wolframite and scheelite)	42	37	10	6	6
Zirconium concentrate (zircon; exports)	57	57	65	206	150
Nonmetals:					
Cement thousand tons	286	331	326	362	417
China clay do	1	2	4	1	1
Monazite (exports)	43	708	637	899	308
Xenotime (yttrium mineral; exports)	[e] 5	[e] 5	5	5	---------
Mineral fuels:					
Coal, bituminous, low-grade thousand tons	7	---------	---------	---------	---------
Petroleum:					
Crude, Sarawak thousand 42-gallon barrels	433	435	418	373	352
Refinery products:					
Sarawak [e] [3] do	15,123	16,877	17,500	17,500	18,500
Malaya-Singapore [e] [4] do	---------	13,337	39,931	44,544	50,000

[e] Estimate.

[1] All production from Malaya unless otherwise shown.

[2] Includes metal smelted from imported tin concentrates.

[3] Processed at Lutong refinery; mostly from crude supplied by pipeline from Brunei.

[4] Includes reprocessing of sizable quantities of oil products imported in unfinished form.

TRADE

A substantial part of Malaysian trade was conducted through the free port of Singapore, the principal petroleum distribution center in the Far East and one of the world's leading ship-bunkering ports. Penang, another free port, has been noted for its tin trade. Singapore and Malayan trade statistics are published in both separate and combined forms, but the two types of statistical presentations are not completely reconcilable, apparently because of time differences in shipments. Sarawak and Sabah maintain separate statistics and no attempt has been made at consolidation.

Indonesian confrontation depressed Singapore's entrepôt trade in 1964; Penang tin trade was lower as Indonesian tin concentrates were diverted to the Netherlands. Import of refined petroleum products was somewhat less in 1964 but crude imports were considerably higher because of Malayan refinery startups. Overall value of mineral exports exceeded that of mineral imports by about one-fifth in 1963 compared with a one-third margin in 1962. Tin and iron ore provided by far the bulk of Malaysian mineral exports; Japan received all the iron ore, and the United States received the largest share of the tin. Unwrought-tin exports from Malaya and Singapore during 1963 totaled

86,819 long tons valued at about $214 million; tonnages fell considerably in 1964. Shipment patterns for tin and iron ore during 1964 remained about the same.

TABLE 2.—Malaysia: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
MALAYA			
Metals:			
Bauxite .... thousand tons	320	457	Japan 415.
Columbite-tantalite concentrate	65	66	All to United States.
Copper concentrate	1,250	1,520	All to Japan.
Gold bullion .... troy ounces	2,314	----------	
Ilmenite concentrate .. thousand tons	103	149	Japan 74.
Iron ore .... do	6,540	6,690	Japan 6,615; Taiwan 64.
Iron and steel scrap	14,900	35,600	Japan 23,200; Singapore 10,900.
Manganese ore	1,400	7,000	All to Japan.
Monazite concentrate	637	899	Mainly to United States and United Kingdom.
Tin:			
Ore .... long tons	712	679	Singapore 677.
Unwrought .... do	81,358	84,551	United States 35,455; Japan 13,406; Italy 5,214; Belgium 4,295; France 3,272.
Slag and hardhead[1] .... do	r 3,110	12,848	United States 11,400; United Kingdom 1,448.
Zircon concentrate	65	206	All to Japan.
SINGAPORE			
Metals:			
Aluminum, all forms	1,330	1,430	Malaya 1,060.
Copper and alloys, all forms	790	940	Malaya 820.
Iron and steel:			
Pig iron	1,280	892	All to Malaya.
Steel bars and rods	27,600	34,000	Malaya 27,700.
Angles and shapes	7,300	9,800	Malaya 8,700.
Other semimanufactures	23,100	65,700	Malaya 49,600.
Lead, all forms	433	319	Malaya 194; Denmark 71 (unwrought).
Silver .... thousand troy ounces	1,892	1,736	Mostly to United Kingdom.
Tin, unwrought .... long tons	1,409	2,268	Belgium 520; Italy-San Marino 271 Turkey 170; New Zealand 161.
Zinc, all forms	992	568	Malaya 261; Sarawak 125.
Nonmetals: Cement (re-exports) .... thousand tons	78	101	Malaya 68; Java 16.
Mineral fuels:			
Petroleum:			
Crude (reexports) .... do	1,225	1,236	All to Sumatra.
Refinery products:			
Gasoline .... do	962	1,010	Thailand 228; South Vietnam 201; New Zealand 192; Australia 118.
Kerosine .... do	730	748	Australia 137; Thailand 136; Hong Kong 102; South Vietnam 96.
Distillate fuel oil .... do	1,091	1,230	Thailand 311; Malaya 284; South Vietnam 280; Hong Kong 107.
Residual fuel oil .... do	1,075	1,010	Japan 364; Hong Kong 235; South Vietnam 142.
Lubricants .... do	13	32	Thailand 12; Malaya 11.

r Revised.

[1] Malaya and Singapore.

TABLE 3.—Malaysia: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
MALAYA			
Metals:			
Aluminum, all forms	4,460	3,400	United Kingdom 1,410; Japan 570.
Copper and alloys	1,920	2,020	Rhodesia-Nyasaland 975; United Kingdom 520.
Iron and steel:			
Pig iron	2,810	5,240	Mainland China 2,680; Australia 1,230.
Steel bars and rods	74,500	71,600	Japan 47,000; mainland China 10,070; Belgium 5,000.
Angles and shapes	22,400	24,100	Japan 8,870; Belgium 7,300; United Kingdom 4,850.
Plates and sheets	62,100	60,000	Japan 53,000.
Other products [1]	[r] 74,500	85,000	Japan 29,000; United Kingdom 18,100; United States 6,900.
Lead, all forms	709	732	Australia 300; Singapore 98; United Kingdom 85; Japan 75.
Tin:			
Ore ... long tons	34,518	27,612	Thailand 12,281; Indonesia 11,543; Burma 1,995; Singapore 559; Laos 554.
Metal and alloys ... do	357	217	Sumatra 114; Singapore 57.
Slag and hardhead ... do	1,636	54	All from Singapore.
Zinc:			
Ore	127	408	Australia 405.
Metal and alloys	2,126	1,140	Australia 878; Japan 128.
Nonmetals:			
Alkaline and rare-earth minerals	690	940	United Kingdom 450; Israel 325.
Asbestos	1,660	3,220	Canada 450.
Cement (mainly clinker) ... thousand tons	199	200	Japan 60; mainland China 55; Taiwan 23; Hong Kong 8.
Gypsum and plasters	18,650	17,700	Australia 17,400.
Phosphates, natural	70,000	90,600	Christmas Islands 66,000; Japan 11,700.
Salt	63,700	60,700	Thailand 47,000.
Sulfur	1,820	3,200	France 2,650; Hong Kong 400.
Talc	2,490	2,760	Mainland China 1,740; Norway 270 Japan 252.
Mineral fuels:			
Coal:			
Anthracite	17,900	23,850	All from North Vietnam.
Other	12,540	6,100	All from Australia.
Coke	3,520	4,900	Netherlands 2,180; West Germany 726; United Kingdom 577.
Petroleum:			
Crude ... thousand tons	----------	[2] 595	Iran 300; Sarawak 98; Saudi Arabia 94; Iraq 47; Kuwait 39.
Refinery products:			
Gasoline ... do	220	161	Sumatra 70; Bahrein 10.
Kerosine ... do	118	109	Singapore 49; Sumatra 45.
Distillate fuel oil ... do	462	418	Sumatra 203; Saudi Arabia 37; Singapore 18.
Residual fuel oil ... do	516	410	Iran 170; Sumatra 143; Saudi Arabia 40; Singapore 32.
Lubricants ... do	31	20	United States 9; United Kingdom 3.
Asphalts and bitumens ... do	45	36	Singapore 15; Iran 8.
Other ... do	5	4	United States 2.

TABLE 3.—Malaysia: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
SINGAPORE			
Metals:			
Aluminum, all forms	2,440	5,500	Hong Kong 1,890; Japan 1,700; United States 1,090 (mostly pig aluminum).
Copper and alloys, all forms	1,470	1,500	Japan 792.
Iron and steel:			
Pig iron	7,780	10,480	Republic of South Africa 7,920.
Steel bars and rods	68,900	82,980	Japan 38,400; mainland China 27,300.
Angles and shapes	18,500	26,700	Japan 11,400; Belgium-Luxembourg 7,600.
Plates and sheets	61,800	84,500	Japan 68,600.
Other products	63,700	63,900	Japan 28,300.
Lead, all forms	[r] 322	385	United Kingdom 130; Burma 48.
Tin, unwrought long tons	1,375	727	Malaya 726.
Zinc, all forms	775	681	Australia 374; Belgium-Luxembourg 185.
Nonmetals:			
Asbestos	5,020	6,630	Rhodesia-Nyasaland 3,720; Australia 1,300; Canada 940.
Cement thousand tons	336	423	Japan 300; mainland China 63.
Lime	3,680	4,220	Japan 1,880; Malaya 1,680.
Phosphate	22,300	30,200	Christmas Islands 19,600; Japan 6,500.
Mineral fuels:			
Coal	9,000	3,600	Unspecified.
Coke	3,140	5,410	Taiwan 2,090; Australia 1,270.
Petroleum:			
Crude oil thousand tons	3,005	3,370	Kuwait 3,115; Iran 244.
Refinery products:			
Gasoline do	755	827	Sumatra 229; India 139; Iran 119.
Kerosine do	905	725	Sumatra 315; Borneo 122; Aden 83; Iran 83.
Distillate fuel oil do	1,540	1,386	Sumatra 428; Sarawak 344; Kuwait 200.
Residual fuel oil do	2,510	2,740	Sumatra 682; Sarawak 455; Australia 445; Iran 415.
Lubricants do	30	53	United States 15.

[r] Revised.
[1] Mostly steel pipe and wire.
[2] Refining started up at Port Dickson in 1963.

COMMODITY REVIEW

METALS

Bauxite.—Both Malaya and Sarawak produced bauxite for export, mostly to Japan but some to Taiwan. Output, valued at about $4 million, was a little higher than that of the previous year. Ores brought about $6 per ton f.o.b. Three-fourths of the production was from two deposits in Johore, mined by Southeast Asia Bauxite, Ltd.; the rest was from the Munggu Belian mine of Sematan Bauxite, Ltd., near Kuching, Sarawak. Production for 1965 was forecast lower, at about 550,000 tons.

Gold.—The Bau district, Sarawak, supplied several thousand ounces of gold, principally from low-grade quartz deposits, and the rest was mainly from Malayan tin mining.

Ilmenite.—The market for ilmenite, a tin-mining byproduct, was generally poor but was improving in Japan and Western Europe. The French pigment company, Fabriques de Produits Chimiques de Thann et de Mulhouse, was reported to have arranged for a charter to ship ilmenite from Penang to France during 1965–66 while its deposits in Senegal are being developed.

Iron Ore.—At yearend 23 iron mines were in operation in 7 Malayan States, together producing from 250,000 to 666,000 tons of ore monthly. Output for the year was below the 1963 peak and exports were slightly lower at 6,418,000 tons worth $53.5 million. All but two mines are

Asian-owned. These two, the Buket Besi (Dungun) in Trengganu and Buket Ibam (Rompin) in Pahang, both owned by Eastern Mining and Metals Co., controlled by U.S. investors, accounted for almost two-thirds (about 2 million tons each) of the total production. Dungun's output decreased nearly one-third apparently because of mining problems. Mines in Johore and in other States, smaller in size but producing higher grade ores than those in other areas, led a more uncertain existence depending on short-term sales contracts. Nearly all ores went to Japan. Malaya has been Japan's largest supplier for years but there were signs that the Japanese might be shifting their buying emphasis to other countries. Estimated reserves at Dungun were 28 million tons, and with development continuing at Rompin 8 million tons of reserves were added. Although several smaller mines neared depletion in 1964, new mines with sizable reserves were reported ready to start up if demand improved. Furthermore, magnetic surveys over virgin jungle have indicated good future prospects.

No new discoveries were reported in 1964. The Pasaki deposit several miles from Rompin was under development and ores started to move over an excellent highway to the railroad at Rompin for movement to the coast. Pasaki ores are somewhat lower grade than Rompin's and have about the same contaminants. Stringent grade control was practiced at both mine and docks. Screening the ore at dockside improved the grade but cut the tonnage by about 10 percent. Subgrade ore was stockpiled for possible blending.

Iron and Steel.—The Malayawata Iron and Steel Co. steel plant planned for Prai on Malaya's west coast was held up, but it appeared construction might begin in 1965, depending on outcome of financial dealings with International Finance Corp. The project held Pioneer status, allowing up to 5 years' tax exemptions. Sponsors, including Yawata Iron & Steel Co., Ltd. (Japan), and Malayan Industrial Development Finance (Malaya), offered to expand their investment from an initial $17 million to $250 million over 10 years if warranted. As planned, the plant was to have two blast furnaces and two converters and will consume Malaysian ore to produce 110,000 tons annually of finished steel products, expandable to 800,000 tons.

Malayan and Taiwan capital was invested in the $3 million Thy San Steel Mill under construction at Butterworth. Production was slated to begin in 1965, using local scrap heretofore exported, and was planned at 12,000 tons of bars and rods annually, expandable to 40,000 and eventually 120,000 tons of products. Several Japanese-financed galvanizing plants were either planned or under construction in Malay and Singapore.

In Singapore a Japanese steel mission was arranging to build a $15 million sheet-rolling mill; expansion of the new 70,000-ton National Iron & Steel Mills, Ltd., plant at Jurong was underway with a second electric furnace due in 1965, along with more casting and rolling equipment; and two steel-pipe manufacturers, Similpan Steel Industries and Malaysia Steel Pipe Manufacturing Co., Ltd., both jointly Japanese-Malaysian ventures, were completing plants with capacities of about 1,000 tons monthly, to use raw materials imported from Japan.

Sarawak imported and consumed 13,000 tons and Sabah 16,000 tons of iron and steel semimanufactures in 1963. Main suppliers were Japan, the United Kingdom, and mainland China.

Tin.—Malaya, with its rich Kinta Valley deposits, remained the foremost world tin producer. Disappointingly, 1964's mine tin production was only 57 tons higher than in 1963 despite incentives of record-high world prices; in fact, less was produced in April through August than in the corresponding months of 1963. Concentrate output totaled 79,577 long tons, averaging 75.47 percent tin, with 78,057 tons delivered to smelters at Penang (Eastern Smelting Co., Ltd.), at Butterworth (Straits Tin Corp., Ltd.), and to the new Japanese Ishihara Sangyo Industrial Co. smelter, completed about mid-1964 at Klang. The latter plant, under the name of Oriental Tin Smelters, Ltd., was expected to produce 750 to 1,000 tons of refined tin per month from Ipoh-area ores for export solely to Japan.

Imports of tin concentrates totaled 13,250 long tons, containing an estimated 73.12 percent tin, and were slightly less than one-half of the 1963 imports. Tonnages were divided as follows: Thailand 11,842; Laos 678; Burma 584; and Kenya 146. Exports of tin metal and a little tin-in-concentrates during 1964 totaled 71,315 long tons, compared with 86,094 in 1963; the drop was brought about by loss of Indonesian trade. The United States was the main destination for tin, taking 25,734 tons, followed by Japan with 14,370 tons, India 4,220 tons, Canada 3,848 tons, and Italy-San Marino 3,797 tons. Eastern Europe shipments came to 4,691 tons. Exports to the United States were 9,845 tons less than in 1963. Mine and smelter stocks of tin metal and tin-in-concentrates at yearend totaled 6,730 tons, compared with 7,175 tons a year earlier. Although shipments were several thousand tons lower in 1964, export duties paid on deliveries to smelters totaled $30.7 million, compared with $23.3 million in 1963. The average market price for tin was $3,401 per long ton as against $2,501 per long ton in 1963.

Because of continuing downtrend in ore grades and because of mining complications, higher prices were not readily translatable to increased tonnages; however, expansions during the year, including 3 dredges and 175 additional gravel-pump operations, were encouraging. At yearend 69 dredges, 768 gravel-pump operations, and 63 other operations were active. Dredging accounted for 42.8 percent of the output, whereas 44.8 percent came from gravel pumping which tends to be more price responsive. Main production was in Perak and Selangor but all states except Kelantan reported some output. The largest individual producer was Berjuntai Tin Dredging, Ltd., with 3,274 long tons of tin concentrates in 1964; 18 other companies reported outputs over 1,000 tons.

Since the Malay Reservations were opened to prospecting in 1962, the Government's Mineral Investigation Drilling Unit had established 12 favorable tin areas, 11 in Perak and 1 in Selangor; about one-fifth of the total area studied was reported to have good potential. The quest for tin threatened several villages situated on tin-bearing ground. A few small rich deposits were found but a significant part of new production came from ground previously worked or passed over. Berjuntai Tin scheduled trials of a new dredge for early in 1965, and

Tronah Mines, Ltd., opened a new area for dredging in the Batang Padang district of Perak. An unusual number of applications was received in 1964 by central and State governments, requesting offshore prospecting rights, mainly on the west coast.

NONMETALS

Cement.—Confrontation had little effect on public and private construction projects, centered mainly in Singapore and Kuala Lumpur, and Malaysian cement consumption continued at about the 1-million-ton level in 1964. Singapore's net imports of cement averaged about 25,000 tons per month, most of this in the form of clinker from Japan going to the 3-year-old-waterfront grinding and packing plant of Singapore Cement Industrial Co., Inc. The plant produced 193,704 metric tons of cement in 1963. New at Singapore was a 250,000-ton plant, being built by a Pan-Malaysia Cement Co. subsidiary, and scheduled to start up before yearend, with enough capacity alone to satify most local demand.

In Malaya cement production rose and imports fell as new cement plants began operating. About midyear, Tasek Cement, Ltd., brought into production its 150,000-ton dry-process plant at the Tasek Industrial Estate, Ipoh, and in September Pan-Malaysia Cement Works commissioned a 500,000-ton plant at Kanthan, north of Ipoh. Tasek planned to install a second kiln and double production in 1967; Pan-Malaysia also had plans for future doubling of capacity. The established Rawang, Selangor, plant of Malayan Cement, Ltd., operated at about its 300,000-ton capacity in 1964, while management looked for a site to build a second plant. Pan-Malaysia, wanting to enlarge the important central Malayan market, was setting up a 10,000-ton-per-month railside cement-packing plant at Segambut, near Kuala Lumpur. With such expansions Malaysia appeared headed toward self-sufficiency in cement or even a surplus that would put the country in an exporting position.

Sarawak and Sabah cement consumption was indicated by the approximate 30,000 tons each imported in 1963, mainly from Japan, Taiwan, and mainland China.

Phosphates and Other Fertilizers.—More than 100,000 tons of high-grade ground-phosphate rock was applied to Malaysian crops in 1964, two-thirds imported from the Christmas Islands and the rest from the United States; consumption was expected to rise 10 percent in 1965. At the Jurong Industrial Estate, the U.S. firm, International Ore and Chemical Corp., was building a compound fertilizer plant to be operated by Agricultural and Industrial Chemicals Corp., producing ammonia, ammonium sulfate, sulfuric acid, ground-phosphate rock, and granulated mixtures. Chemical Co. of Malaysia, Ltd., was due to complete a mixed-fertilizer plant at Selangor in 1965. Manufactured fertilizers amounting to 186,000 tons valued at nearly $30 million were imported in 1963, mainly from the United Kingdom and West Germany. About four-fifths of the tonnage was nitrogenous and one-eighth potassic.

MINERAL FUELS

Coal.—Negotiations continued on a Japanese proposal for developing Sarawak's Silantek coking coalfield. Nippon Coal Mining Co. (Japan) had outlined a reserve of 60 to 70 million tons in the area and joined with Yawata Iron & Steel Co. (Japan), which hoped to purchase 240,000 tons of coal annually in 1967–77. Security of the coalfield area, near the Indonesian border, raised investment questions. Among projects included in Sarawak's 1964–68 development plan was construction of a good road to the area; a mine-site, coal-fired powerplant linked with Kuching was being considered. Sabah deposits of noncoking subbituminous coal suitable for steamplant use on Labuan Island were estimated to contain reserves of 9 million tons.[6]

Petroleum.—Malaya's second refinery, Esso Standard, Ltd., 24,500-barrels-per-day installation at Port Dickson, Selangor, was opened in March 1964, less than a year after the May 1963 opening of Shell Refining Co., Ltd., 20,000-barrel-per-day Port Dickson plant. Also operating in 1964 were the Shell 45,000-barrel-per-day Lutong refinery in Sarawak, its estimated 15,000-barrel-per-day Pulau Bukom refinery at Singapore, and the 30,000-barrel-per-day Singapore plant of the Maruzen Toyo Oil Co. Late in the year Maruzen's assets were purchased by British Petroleum Co., Ltd., and a local subsidiary, British Petroleum Malaysia, Ltd., was set up to retail products. In connection with the Esso refinery it was announced the company had awarded a contract for a $7 million ammonia plant at Port Dickson to use byproduct gases. Shell announced plans to put $4 million into its Singapore refinery for a hydrodesulfurizer, additional liquefied-gas equipment, and dock facilities. Construction of Mobil Refining Co. (Malaysia), Ltd. (Socony Mobil Oil Co. subsidiary), 18,000-barrel-per-day Jurong refinery at Singapore began in the fourth quarter of 1964 with completion scheduled early in 1966. Investments were planned in sales and distribution facilities, nearly matching the estimated $13 million refinery cost.

Net crude oil entering Malaysia totaled about 6.05 million metric tons compared with an estimated 4.65 million tons in 1963 (breakdown in 1963, as follows: Singapore 2.13; Sarawak 1.90; and Malaya 0.62). The Lutong refinery in Sarawak processed dwindling output of the Miri field in Sarawak (Malaysia's only crude production), plus crudes imported by pipeline from Brunei's Seria field. In 1963 the refinery processed more than half of Brunei's 29,639,000-barrel crude output, 11,877,000 barrels moving on as crude through Lutong for export. About one-half of the refined product was distillate fuel oil. Besides crude, Brunei in 1963 produced 1,127 million cubic meters of natural gas and 676,368 barrels of natural gasoline. Local sales of gasoline in Brunei were reported at 76,512 barrels. Sarawak exports of refined products in 1963 included 1.89 million tons plus about 50,000 tons of bunkers; imports were about 86,000 tons. Sabah imported about 143,000 tons of refined products in 1963, mainly from Indonesia.

---

[6] Wilson, R. A. M. The Geology and Mineral Resources of the Labuan and Pada Valley Area, Sabah, Malaysia. Geological Survey Department, Borneo Region, Malaysia, Kuching, Sarawak, Memoir 17, 1964, pp. 102–121.

Exploration activities were intensified in 1964, particularly in offshore areas. The Brunei Government had called in Walter J. Levy Co. of New York to assist in drawing up legislation passed in October 1963 and retained the firm to consult on oil policies. The proposed legislation was more practical than before, recognizing higher costs for exploring at increasing distances from shore. Under the new law, profit sharing was raised to 50:50, but royalties could be deducted from assessable income and the door was opened for the first time to non-British leaseholders. Clark Oil and Refining Corp. of Milwaukee, Wis., was one of the initial firms to take advantage of this provision and was investigating a concession in Brunei's Lutong district previously abandoned by Shell. Brunei Shell Petroleum Co. successfully brought in at least three wells from its drillship "Sidewinder" at South West Ampa, off Kuala Belait; together these wells produced 5,000 barrels daily on test. The company also was building a fixed platform for further drilling. The ship has been moved to a new position off Baram, Sarawak. A marine seismic survey was being conducted for Sabah Shell Petroleum (formerly Shell Co. of North Borneo); Esso was interested in exploring the area off the northwest coast of Sabah; other possibilities for petroleum exploration were studied off the east and west Malaya peninsula coasts.

The Mineral Industry of Mongolia

By K. P. Wang[1]

◆

MUCH of the economic and industrial activity of sparsely populated Mongolia was centered around the capital of Ulan Bator. Mongolia's 1964 industrial output value was about $230 million. Although minerals and basic materials were gaining in importance at the expense of animal husbandry products, only fluorspar production had world significance. Nonetheless, a variety of minerals was produced and many resource projects were being constructed. Although coal was the leading mineral product from the domestic viewpoint, only small quantities were produced from a reserve that could support a much larger output. Minor amounts of oil were extracted and refined, and deficiencies in supply were met by imports.

Much progress took place in the development of the Darkhan (Darhan) industrial complex near the Soviet border and near to the Kyakta-Ulan Bator-Peking Railroad, where easily accessible resources of coal, iron ore, clays, limestone, and sands are available. The 1-million-ton-per-annum Sharyn Gol open-pit coal mine of the Darkhan complex was nearing completion by yearend. The Soviets were helping to build this coal mine, as well as a steel plant, a powerplant, and a glass plant; the Czechs helped build a cement plant and the Poles a large brick plant. Czech geologists reportedly discovered copper-molybdenum and phosphate deposits in northern Mongolia.

Chinese technical workers numbering more than 10,000 were asked to leave the country starting in April 1964, because of the Mongolian policy to strengthen ties with Moscow. Sino-Mongolian trade also was substantially reduced. Meanwhile, Soviet influence increased. By late 1964, the U.S.S.R. was heavily involved in helping the Mongolians build mines and industrial plants.

PRODUCTION

Mongolia's mineral output statistics for 1960–64 have been reported at various times, and reasonable estimates can be made for certain missing data. Coal, petroleum, and nonmetals were the leading items. However, despite absence of information, several million dollars worth of metallic ores may have been produced annually. The mineral output value was very low, even by Far East standards, as the small domestic market for minerals could not support a large production.

---

[1] Chief specialist, East Europe-Far East, Division of International Activities.

TABLE 1.—Mongolia: Production of minerals [1]

(Metric tons)

Commodity	1960	1961	1962	1963	1964
Nonmetals:					
Alabaster (gypsum)	10,000	10,000	10,000	15,000	20,000
Fluorspar (fluorite)	40,300	38,000	37,900	[r] 50,000	57,000
Lime	10,000	13,000	21,000	25,000	30,000
Salt	6,100	7,000	8,000	8,000	8,000
Mineral fuels:					
Coal [2]	618,800	748,600	860,000	845,000	710,000
Petroleum:					
Crude oil	40,000	50,000	50,000	50,000	50,000
Refined oil:					
Gasoline	17,800	18,000	[r] 17,900	[r] 18,200	18,000
Diesel oil	7,040	7,280	[r] 7,100	[r] 7,680	8,200
Residual fuel oil	28,600	30,000	30,000	32,000	32,000

[r] Revised.

[1] All figures are estimated, except fluorspar for 1960–62, lime for 1961–62, salt for 1960, coal for 1960–63, gasoline, diesel fuel, and residual fuel for 1960. Other metals and nonmetals known to be produced include gold, lead, zinc, tungsten, clays, dolomite, limestone, and sand, but quantitative information are not available.

[2] Mainly so-called brown coal.

TRADE

Mongolia's value of annual imports has been from about $130 million to $150 million, and annual exports ranged from $70 million to $90 million. Most trade was with the U.S.S.R., and for this reason, in the absence of Mongolian statistics, Soviet imports from Mongolia and exports to Mongolia have been used to show the trends of Mongolian trade. Only a small percent of Mongolian exports involves mineral products, and perhaps 15 percent of the imports consists of commodities of this group. Fluorspar was the only significant mineral export; Soviet imports from Mongolia totaled 47,100 metric tons in 1963 and 37,500 tons in 1962. Soviet metal and mineral exports to Mongolia were chiefly iron and steel, mineral fuels, and cement.

TABLE 2.—Mongolia: Imports of metals and minerals from the U.S.S.R.

(Metric tons)

Commodity	1962	1963
Metals:		
Iron and steel:		
Pig iron	1,000	200
Rolled steel	22,500	16,800
Iron and steel pipes	[r] 4,500	4,200
Nonferrous metals and alloys	[r] 198	267
Nonmetals:		
Cement	15,000	14,000
Mineral fuels:		
Bituminous coal	180,000	31,000
Coke	1,000	2,000
Petroleum:		
Crude	30,900	37,300
Refinery products:		
Gasoline	75,400	80,600
Diesel fuel	48,000	47,300
Lubricants	9,600	10,900
Other	800	900

[r] Revised.

Source: Official trade returns of the Soviet Union.

COMMODITY REVIEW

METALS

Iron and Steel.—The most important 1964 news was the continued construction of a 300,000-ton-per-annum integrated steel plant in the Darkhan complex by "thousands" of Soviet workers. Nearby iron and coal mines were being developed simultaneously. Iron deposits east of Ulan Bator were not yet exploited, but a few small foundries and metal processing plants in the capital had undergone moderate expansion in recent years.

Other Metals.—More than 100 tons of wolfram-scheelite concentrates was produced at the Ih Hairhan and Burentsogt mines during 1964; operating costs were high at these small tungsten mines and output targets were not fulfilled. However, increased production was contemplated as witnessed by the 1965 target of Ih Hairhan to produce two-fifths more than in 1964. Gold has been a traditional product, although no statistics have ever been revealed. A little lead-zinc ore from the Onder Haan area was produced for export to the Soviet Union.

NONMETALS

Cement.—The growing need for cement has prompted the country to build a cement plant of 100,000-ton to 200,000-ton annual capacity southeast of the Burbantyn Plain in the Darkhan area; this plant was under construction at yearend. The Mongolians had originally planned to produce about 50,000 tons of cement in 1965. Meanwhile, requirements have been met in part by imports from the Soviet Union and China.

Fluorspar.—Mongolia's estimated 1964 output of fluorspar represented about 2.5 percent of the world total. The principal mines are located in the Berkh (Berhiyn) district in Dorono Gobi Aymag (44°30′ E.; 110°00′ N.). There were about 20 mine sites in operation during 1964, serviced by a power station and a machine shop. Virtually all Mongolian fluorspar went to the Soviet Union which paid about $39 per ton for this mineral in 1963.

Other Nonmetals.—Mongolia's second alabaster plant, of 10,000-ton-per-annum capacity and located in the Dundgob Aymag, went through the first year of full-scale operations in 1964. Plans were made to further expand the country's alabaster output. Enlargement of the Tsagaan Bula lime plant in the Darkhan area was presumably completed. Fair tonnages of clay, sand, dolomite, and salt also were produced. Perlite production was being considered.

MINERAL FUELS

Coal.—Mongolia's principal operative coal mine in 1964, Nalaikha, 35 kilometers east of Ulan Bator, which exploits 4,900-kilocalorie brown coal, produced nearly one-fourth less coal than in the previous year (623,000 tons in 1964) because of inefficient management. Combined output from other coal mines was less than 100,000 tons. Most of these other mines (in Bayan Ology, Ubsa Nuur, and Hobsogol, Obor Hangay, and Gobi Altay Aymags) were still being developed.

Expected completion of Sharyn Gol coal mine in mid-1965 may eventually more than double the country's coal production. In fact, the 1965 national coal target is 3.1 times the 1960 output. With some 500 Soviet coal miners assisting development of the Sharyn Gol operation, about 2.5 million cubic meters of overburden had already been removed by yearend 1964. A railway and powerline to Darkhan were completed. Workable reserves of high calorific coal were reported at 116 million metric tons for Sharyn Gol, from six seams the thickest of which is 15.5 meters.

Petroleum.—As of 1964, Mongolia's small petroleum industry was still far from achieving self-sufficiency. Crude output exceeded target, but refined output fell short of goal. A Soviet-built refinery of possibly 100,000-ton annual crude capacity at Dzuun Bayan near the Sayn Shanda oilfield in the Gobi Desert processed both local and Soviet crude. Additional refined petroleum had to be imported, roughly 140,000 tons in 1963, all from the Soviet Union.

The Mineral Industry of the Philippines

By J. M. West[1]

◆

THE Philippines contributed sizable quantities of chromite, copper, gold, and mercury to world supplies in 1964. Outstanding internationally was its output of refractory chromite. Philippine copper, gold, and mercury represented close to 1 percent of world production. Iron ore and molybdenite were of secondary importance.

Crude mineral output in 1964 was about 8 percent above the $111 million value in 1963 and comprised an estimated 2.5 percent of the gross national product (GNP). Exports of base metals, particularly copper, were the source of 8 to 9 percent of the country's foreign exchange. American and Japanese participation has been an important factor in Philippine mineral development, but increasing amounts of domestic capital were being invested in mining and beneficiation operations. However, large projects remained difficult or impossible to finance without major foreign investment.

By 1964, oil refinery capacity based upon foreign crude was adequate for domestic consumption, cement output was about equal to demand, establishment of an integrated steel industry was underway, and pyrite resources were ready for large-scale exploitation in connection with fertilizer manufacture. U.S.-Canadian interests were developing a large copper deposit on Marinduque Island, chromite production potential was increased by the opening of the Zambales Mineral Reservation deposit on Luzon, and Mindanao was considered as a site for an aluminum reduction plant. The largest iron ore producer was completing a concentrator and purchased equipment for a pelletizing plant; magnetite recovery from copper milling increased; and an agreement was signed for a large investment in a steel mill at Iligan, Mindanao, while promotion continued for a steel mill in Rizal Province. Several cement plants began production during the year, and others were being planned. A large fertilizer plant was scheduled for completion by late 1965, and a pyrite recovery operation was being established at Bagacay to supply sulfur for the plant. Showings from oil drilling remained insignificant.

GOVERNMENT POLICIES AND PROGRAMS[2]

The Government's 5-year socioeconomic program, in its second year, while aiming to boost the growth rate, was having an inflationary effect on the economy so that stability of the peso was threatened.[3]

---

[1] Physical scientist, Division of International Activities.

[2] U.S. Department of Commerce. Basic Data on the Economy of the Philippines. Overseas Business Reports 64–7, February 1965, 20 pp.

———. Establishing a Business in the Philippines. Overseas Business Reports 64–11, February 1964. 16 pp.

———. Foreign Trade Regulations of the Philippines. Overseas Business Reports 63–138, November 1963, 8 pp.

———. Philippines: U.S. Faces Stronger Competition as Tariff Preferences Go Downward. International Commerce, V. 70, No. 27, July 6, 1964, p. 40.

[3] Exchange rate, US$1.00=3.90 pesos.

To curb inflation the Government imposed credit restraints and encouraged foreign trade and investment inflow. Trade balances remained favorable and revenue rose; however, buying power of the peso fell. Decontrol of the peso continued to stimulate trade and the outlook for further improvement was good; it was expected that Congress would remove the requirement on exports whereby conversion was made on 20 percent of the receipts at only half the official exchange rate. Foreign and domestic investments failed to reach desired levels, and mineral development suffered owing to the lack of a foreign investment law and resultant uncertainties, doubts about outcome of long-term investments after the 1974 expiration of the Revised U.S.-Philippine Trade Agreement, and effects of the Retail Trade Nationalization Law which restricted foreign participation in product sales.

President Macapagal signed Republic Act 4167 amending the Nickel Law to encourage development of the lateritic nickel-iron-cobalt deposits on the Surigao Mineral Reservation. Contrary to existing corporation law, the Act provided that the successful bidder could be either a complex or a single company. In December the Surigao Reservation Board put out invitations to bid on operation of Parcel II of the area (estimated 147 million tons of ore); bids were to be receivable until May 12, 1965. Bills covering foreign investments, mining incentives, and extension of the Laurel-Langley Agreement past 1974 were still being argued. Special tax exemptions favoring establishment of basic industries such as mining and mineral processing were due to expire during 1966–68. Republic Act 3823 granted 5-year tax exemptions (not on income) after certification for new or reopened mines. Tariffs were raised by executive order on certain aluminum and steel products. A bill under review in the Philippine Senate would place a tariff on gypsum, raise duties on limestone and battery oxides, and lower duties on asbestos, petroleum bitumens and coke, and lead oxides.

The Philippine Bureau of Mines sponsored the first of an annually scheduled series of Symposia on Mineral Resources Development and Mine Safety at Manila during November 23–25, 1964; an impressive group of 67 papers were presented. The Bureau published its first full-color geologic map of the Philippines in 8 sheets with a scale of 1:1,000,000. Cooperative studies under the U.S. Agency for International Development (AID) program included a nationwide iron ore survey, laterite studies, geological mapping, and ore dressing research.

To further its policy of providing cheap, dependable electrical power, the Government looked for outside assistance to consolidate and solve generation and regulatory problems. Industrial power sales totaled 971.2 million kilowatt-hours in 1964, 14 percent more than in 1963. Increases were notable in the cement and chemical industries. The Government-owned National Power Corp. planned the following four major projects: the Maria Cristina No. 4 hydroelectric works ($2.4 million); a Bataan thermal plant ($3.6 million); Ilocos electrification ($1.8 million); and Southern Luzon grid extension ($0.6 million); and expected to quadruple its generating capacity by 1972.

PRODUCTION

In 1964 the reported production value of crude minerals was about $121 million, compared with that of $111 million in 1963; these value data take no account of "added values" from the mineral processing sector of the industry except for the traditional inclusion of cement. Base and precious metal ores accounted for two-thirds of the total; cement accounted for most of the rest. Copper, from about nine pro-

TABLE 1.—Philippines: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964 ^{p}
Metals:					
Cadmium, content of zinc concentrate kilograms	----------	----------	600	11,200	11,000
Chromite:					
Metallurgical thousand tons	128	144	98	^{r} 86	^{r} 79
Refractory do	606	496	433	^{r} 373	^{r} 426
Total do	734	640	531	^{r} 459	^{r} 505
Copper, content of concentrate, largely 22 to 29.5 percent copper	44,010	51,875	54,728	^{r} 63,685	^{r} 60,489
Gold troy ounces	410,618	423,983	423,394	^{r} 376,006	425,770
Iron and steel:					
Iron ore and concentrate, 55 to 58 percent iron thousand tons	1,139	1,171	1,387	1,385	1,367
Ferroalloys (mainly ferrosilicon)	2,049	288	1,475	1,296	1,532
Steel ingots (from scrap) ^{e} thousand tons	80	100	120	NA	NA
Lead, metal content of 50 to 60 percent concentrate	122	101	82	71	103
Manganese ore	17,381	19,038	11,939	7,666	8,005
Mercury, estimated content of concentrate 76-pound flasks	3,086	3,167	2,767	2,649	2,496
Molybdenum, metal content of 94 percent MoS^2 concentrate	28	113	113	107	105
Nickel, content of concentrate	----------	9	11	----------	----------
Palladium, content of nickel concentrate troy ounces	----------	215	141	----------	----------
Platinum, content of nickel concentrate do	----------	177	172	----------	----------
Silver do	1,133,343	812,793	675,570	^{r} 767,249	851,814
Zinc, content of concentrate [1]	4,978	3,313	4,460	3,893	2,136
Nonmetals:					
Asbestos	33	75	941	382	532
Asphalt rock	18,371	6,651	6,933	5,186	NA
Barite, 85 to 90 percent $BaSO_4$	5,623	1,913	416	914	1,476
Cement thousand tons	795	1,019	961	951	1,062
Clays, white	24,837	10,823	^{e} 8,000	6,703	NA
Dolomite	12	7,252	4,995	5,089	5,220
Feldspar	3,958	14,759	15,571	6,669	8,051
Gypsum	9,077	8,404	14,453	30,694	35,070
Lime	19,152	25,282	^{e} 43,000	31,396	78,234
Limestone thousand tons	994	1,454	^{e} 1,400	1,480	NA
Phosphatic materials:					
Guano	10,035	402	95	1,473	1,191
Phosphate rock	355	----------	3,773	1,251	2,857
Pyrite	25,400	51,591	56,000	58,055	32,004
Salt, sea thousand tons	95	93	96	70	47
Silica sand (ordinary glass sand)	88,365	106,229	110,000	111,472	183
Sulfur	44	161	941	48	69
Talc	5	190	118	95	98
Mineral fuels:					
Coal thousand tons	148	152	163	157	115
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	3,585	6,264	6,903	8,660	9,189
Kerosine do	666	1,943	2,139	2,509	2,544
Distillate fuel oil do	1,896	4,083	4,893	5,872	6,881
Residual fuel oil do	2,894	4,873	5,942	7,561	9,757
Refinery fuel (including losses) do	588	892	1,005	1,374	^{e} 1,500
Other products do	462	429	1,455	1,545	954
Total do	10,091	18,484	22,337	27,521	30,825

^{e} Estimate. NA Not available. ^{p} Preliminary. ^{r} Revised.

[1] Includes zinc content of copper-zinc concentrates containing 46 percent zinc and 3 percent copper.

ducing companies, was foremost; rising prices in 1964 brought higher returns, even though mine copper output was somewhat less. Gold and silver production, about one-third the value of the copper, ran a little higher in 1964 partly because of greater recoveries from copper. Gold mines continued to operate under subsidy.

Iron ore production was about the same level in 1964 with three producers maintaining their outputs. Metallurgical-grade chromite output was slightly lower but refractory-grade production rose as ores began coming from a newly opened deposit at Masinloc, Zambales. Several new cement plants boosted output of that product above 1 million tons. Molybdenum concentrate was a byproduct at the Sipalay copper mine in Negros Occidental, and cadmium was contained in zinc concentrate shipped by Benguet Exploration, Inc., to Japan. Manganese ore production was down but began to revive in the latter half of the year after a new mine was opened in Isabela Province. Mercury, from one deposit, was slowly declining because of ore grade. The coal market found no improvement. Oil exploration continued to be fruitless, while consumption of crude imported for refining and minor products was rising 8 to 10 percent annually.

TRADE

Mineral export receipts were higher in 1964 chiefly because of rising world prices for copper, iron, and chromite. Exports of ores of these metals exceeded quantities shipped in 1963. Japan continued to receive all of the iron ore, most of the copper, and a large share of the chromite. The United States was the main destination for refractory chromite and the total output of concentrate from the Lepanto copper mine was shipped to the Tacoma, Wash., smelter of American Smelting

TABLE 2.—Philippines: Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destination, 1963
Metals:			
Brass scrap	----------	1,008	Japan 980.
Chromite:			
Metallurgical	71,868	77,135	All to Japan.
Refractory	370,423	406,664	United States 229,981; United Kingdom 88,189; Japan 37,491.
Copper:			
Ore	25,855	19,498	All to Japan.
High-gold concentrate	35,737	52,066	All to United States.
Ordinary concentrate	156,604	263,688	All to Japan.
Metal content of ore and concentrate.[•]	51,000	63,000	Japan 49,000; United States 14,000.
Scrap	1,733	892	Japan 880.
Gold:			
Bullion troy ounces	276,254	160,494	All to United States.
Concentrate and matte [1]	29,984	2,546	Japan 1,485; United States 1,061.
Iron ores and equivalents:			
Ore thousand tons	1,248	1,283	All to Japan.
Concentrate do	87	183	Do.
Pyrite cinder do	11	8	Do.
Manganese ore	8,504	5,342	Japan 2,700; Taiwan 2,642.
Mercury 76-pound flasks	3,444	1,928	United States 1,566; Japan 362.
Molybdenum concentrate	239	172	United Kingdom 132; Japan 40.
Silver and platinum ores	----------	2,447	Probably Japan.
Zinc concentrate	7,550	11,968	All to Japan.
Mineral fuels:			
Gas oil (bunker fuel) thousand 42-gallon barrels	110	381	Malaya 351; Hong Kong 30.

[•] Estimate.

[1] Includes gold- and silver-bearing lead-copper concentrates.

and Refining Co. Export earnings continued to be held back by controls whereby 20 percent of receipts were convertible at only 2 pesos per $1 instead of the higher official rate, causing a 0.38 peso loss to minerals for each $1 traded.

Crude petroleum imports, mainly from Indonesia, Saudi Arabia, Borneo, and Kuwait, increased to meet refinery requirements. Value of imported crude, $50.4 million in 1963, was higher in 1964. Japan and the United States were the main sources of scrap and refined metals as in the past, and imports were generally on the higher side. Philippine copper concentrate was refined under bond in Japan, and the copper was returned to the Philippines. Australia supplied lead and zinc.

TABLE 3.—Philippines: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals and metallic ores:			
Aluminum:			
Ingots, bars, and alloys	2,000	4,800	United States 4,000.
Semimanufactures •	600	800	Japan 400; United States 300.
Copper:			
Ingots and bars	1,217	2,600	Japan 2,400.
Semimanufactures •	3,500	1,700	Japan 900; United States 450.
Iron and steel:			
Pig iron	11,121	10,103	Republic of South Africa 4,280; Australia 2,708.
Ferroalloys	1,150	989	Netherlands 350; Japan 298; Norway 167.
Ingots and semimanufactures • thousand tons	300	335	Japan 222.
Lead:			
Ingots, bars, and alloys	3,665	1,942	Australia 1,352; United States 222; Belgium 140.
Semimanufactures •	400	150	Australia 60; United Kingdom 25; West Germany 17.
Pigments •	500	45	United Kingdom 25; West Germany 17.
Tin ingots and alloys long tons	472	600	Canada 345; Malaya 240.
Titanium oxide	2,194	1,986	United States 759; Japan 428; Belgium 301.
Zinc:			
Ingots and alloys	7,806	7,818	Australia 5,632; West Germany 1,008.
Semimanufactures •	1,200	1,600	Australia 1,270; United States 150.
Pigments	1,200	1,300	Netherlands 500; United Kingdom 200; West Germany 200.
Nonmetals:			
Abrasive including diamond	2,080	236	Netherlands 67; United Kingdom 51.
Asbestos	946	1,354	Canada 463; Republic of South Africa 272; United States 254.
Cement	2,145	49,120	Taiwan 25,401; Japan 16,800.
China clay	1,352	2,273	Japan 831; United States 747.
Diatomaceous earth	1,892	1,368	United States 1,093; Japan 268.
Dolomite	2,300	2,848	Japan 1,730; Austria 515; United States 328.
Fertilizers, chemical thousand tons	294	73	Japan 32; United States 22.
Gypsum and plasters	39,854	20,107	Australia 8,367; Cyprus 6,146; Mexico 2,682.
Phosphate rock	12,489	12,177	All from United States.
Sulfur	2,612	3,824	Canada 3,219; United States 466.
Talc powder	1,737	2,726	South Korea 1,473; Japan 762; United States 443.
Mineral fuels:			
Coke from coal	12,387	14,603	West Germany 8,305; Australia 3,626.
Petroleum·			
Crude thousand 42-gallon barrels	22,437	26,900	Indonesia 8,520; Saudi Arabia 4,380; British Borneo 4,140; Kuwait 3,710.
Refinery products:			
Gasoline do	365	320	Japan 138; United States 47; Bahrain 42.
Kerosine do	144	48	Japan 39.
Distillate fuel oil do	421	307	Japan 284; United States 22.
Residual fuel oil do	402	24	Indonesia 23.
Lubricants do	322	421	United States 311.
Other do	683	129	Indonesia 45; United States 43.
Total do	2,337	1,249	Japan 472; United States 424.

• Estimate.

COMMODITY REVIEW

METALS

Chromite.—New installations and further reserve development improved the outlook for chromite in the Philippines. Consolidated Mines, Inc., the big producer of refractory-grade and main U.S. supplier, brought its Zambales Mineral Reservation (Parcel 1) property into production early in 1964. Operation was set for 200,000 tons annually, backed by a reserve of over 2 million tons developed in 5 years of AID-financed investigations. A 200-ton-per-hour tramline was inaugurated connecting with the Coto mill, which was expanded for handling Parcel 1 ores. Development started on Parcels 2 and 3 of the reservation. At the Consolidated Mines' renowned Coto open pit the better ore was nearly depleted, but large lenses were being developed southwest of the pit in the Hayden-Harding mineral zone. Acoje Mining Co., the leading Far Eastern metallurgical chromite producer, shipped most of its ore to Japan where markets were better than in 1963. The average head analysis at the 1,000-metric-ore-tons-per-day mill east of Santa Cruz was 26 percent Cr_2O_3 and the mining cut-off grade was about 16 percent Cr_2O_3. Acoje also was involved in manganese, copper, and petroleum. Its pilot plant for recovering byproduct nickel and platinum from Zambales ores continued tests for better separation.

Copper.—Mining was expanding in 1964 and tentative plans were made to establish the country's first smelter and electrolytic refinery at Iligan on Mindanao. During the first half of 1964, approximately 31,000 tons of contained copper was produced; Atlas Consolidated Mining & Development Corp. accounted for 43 percent of this, Marinduque Mining & Industrial Corp. for 22 percent, (Sipalay mine—14 percent and Bagacay mine—8 percent), Lepanto Consolidated Mining Co. for 19 percent, and Philex Mining Corp. for 11 percent.

Atlas Consolidated milled better ore from its Biga Road pit, and sank a 1,300-foot shaft at its Lutopan pit in preparation for underground mining. The Atlas Toledo mill, probably the largest concentrator in the Far East, treated 14,000 tons of ore per day. Examination of the Khyber Pass and Lantoy tailings dumps indicated a 0.17 percent average grade and 15 million pounds of copper recoverable based on 50 percent recovery. During a 4-month period of pilot-plant leaching tests on the Khyber Pass dump, including disruption by heavy rainfall, production totaled 85,000 pounds of cement copper averaging 67 percent copper (recovery rate 73.5 percent) with 2.15 ounces per ton of silver. Operations were considered to be a unique example of large-scale leaching in a tropical country. Atlas also produced a magnetite byproduct from copper milling (described under iron ore).

Dragline stripping was well underway at Marinduque Mining's large new Cansibit orebody on Sipalay, and production was scheduled in the second half of the year. Diversion of the Taoangan River from the mining area was underway. The Sipalay mill was being increased to 7,000 tons per day at yearend 1964. At Bagacay on Samar, Marinduque's Guila-Guila pit reached the primary zone and ore flotability improved. A better copper to zinc ratio was obtained by blending the ore feed. Copper recovery from the complex ore was only about 73 percent in 1963, and mill tailings averaged 1.09 percent copper. Construction was underway on a 12-mile aerial tramway to the Canaybon Loading Terminal at Sulat. Mining was due to start on iron ore and pyrite reserves of 1.5 and 4.5 million tons, respectively, when the line is completed in mid-1965. A pyrite extraction section was being added to the Bagacay mill, and details were worked out for supplying pyrite to the ESSO Standard Fertilizer & Chemical Co., Inc.'s, Bataan fertilizer plant.

On Marinduque Island development continued of the Amex-Nippon open-pit orebody, with a proved reserve of 50 million tons of ore averaging 0.82 percent copper and minor gold-silver content. Plans called for milling 10,000 tons daily, exporting half of the concentrate to Japan and the rest to the United States. Gross value of the deposit was estimated to be over $300 million.

Lepanto was faced with harder ore, and milling costs were higher, but profits were still good. Encouraged by increased reserves, management was considering a proposal to expand mine and mill capacity by 50 percent to about 700,000 tons annually. Higher gold content was expected to offset slightly lower grade of copper. Lepanto explored a promising massive sulfide orebody and manganese occurrences discovered in 1962–63 in the Dupax area of northern Luzon.[4]

Grades and recoveries improved at the Philex operation as new stopes were opened and sulfide content of ores rose. Milling increased to 3,500 tons daily, and ore production began from the newly opened 4,300 level. Plans were in preparation to move the mill to a lower site on Banget Creek where capacity would be expanded. Copper Belt Mining Co., a new entry, opened the Lobo mine in Batangas and milled 3 percent copper ore at 600 tons per day. Acoje Mining Co. was planning a 500-ton-per-day mill at its Barlo mine in Luzon, and Benguet Consolidated, Inc., was developing a several-million-ton copper orebody on Rapu-Rapu Island, Albay Province.

Gold.—Benguet Consolidated, Inc., primarily a gold producer accounting for about half of the country's output, had a better year than in 1963; its mill at Acupan, Mountain Province, ran full time. Shaft development at the small, rich Benguet Exploration, Inc., mine continued, and gold content was holding with depth. Some ore was being developed for zinc despite low gold content, and an increase in mill capacity was planned in response to improved zinc prices; a sales contract called for delivery to Japan of 10,000 tons of concentrate in 1964–66. Baguio Gold Mining Co. remained in operation by finding some new oreshoots. Manila Mining Corp. had prospects of developing its gold property in Cabadbaran, Agusan. Itogan-Suyoc Mines, Inc., faced an erratic low-grade ore problem. Byproduct gold was increasing together with higher outputs from copper mines.

Iron and Steel.—Virtually independent iron ore-for-export and steel-from-scrap industries were moving toward at least partial integration as plans went ahead to build an LD (Linz-Donawitz) steel plant at Iligan City, Mindanao. Philippine Iron Mines, Inc., the country's largest iron ore producer (about two-thirds open pit) and a possible source of feed for the new steel operation, was completing a 750,000 ton-per-year (concentrate content 65 percent iron) magnetic concentrator at Larap and signed contracts for a Japanese pelletizing plant to be installed by late 1965 (pellet output set at same level). The plants were to be connected by a 2-mile slurry pipeline. Steps to upgrade the Larap product were made necessary by Japanese steel mills' grade demands. Underground blocks at Larap with 3 million tons of 41 percent iron ore were prepared for sublevel stoping; doubled man-ton productivity was expected to drop extraction costs significantly; and mine life was extended to 30 years.

---

[4] Obial, Rudy C. Geological and Geochemical Investigation of the Copper-Zinc Deposit at Dupax, Nueva Vizcaya. Philippine Bureau of Mines Rept. of Inv. 53, 1964, 19 pp.

Atlas Consolidated Mining & Development, using a new magnetic concentrator recovered 10,000 to 12,000 tons of high-grade magnetite per month from its Toledo copper mill tailings which ran 3 to 3.5 percent magnetite. Completion by Samar Mining Co., Inc., in 1964 of a 7-mile tramline section at its Sibuguey iron mine bypassing the rough upper portion of a 25-mile haulage road between the wash plant and pier at Pamintayan helped to lower costs. Samar's ore reserve at the start of 1964 was estimated to be 7.8 million tons averaging 54.6 percent iron. Output has been 0.4 to 0.5 million tons annually. Philippine Iron Mines' Mati iron deposit, operated under royalty payments by Atlas Consolidated, was closed and concentrating stopped in June.

Other iron deposits were being studied. Benguet Consolidated explored the Camachin deposit northeast of Manila in Bulacan, but the estimated 3.8 million ore tons grading 35 to 40 percent iron was not considered currently economic because of long haulage. Magnetometer surveys at Black Mountain, Inc.'s, Pioneer mine, being developed in Zamboanga del Sur, indicated extensions to the 6 million ore tons previously developed by Surigao Consolidated Mining Co., Inc. An 850,000-ton reserve was estimated for the Lammin deposit, Ilocos Norte.[5] Santa Inez Steel Corp. tried to get backing for an integrated steel operation at Rizal, and was developing its Santa Inez Antipolo property, northeast of Tanay, Rizal. The reserve in August 1964 was estimated to be 35 million tons averaging 54 percent iron and 4.2 percent sulfur—potential ore tonnage was thought substantially higher. The Philippine Bureau of Mines was preparing a comprehensive report and maps on the country's iron resources.

The U.S. Export-Import Bank, Philippine Government, and Iligan Steel Mills, Inc., signed an agreement on January 22 for a $62.3 million loan to build an integrated steel mill at Iligan. The Philippine Government's interest in the final plant, to cost about $117 million, was estimated 77 percent. Equipment was to include two 60-ton basic oxygen converters and a blooming-slabbing mill with an initial rolled-steel capacity of 267,000 tons per year. Koppers International Co., a U.S. firm, was named as prime contractor.

Elizalde Iron & Steel Corp. announced plans to install a second tin plating line of 80,000 tons capacity after completing its first 60,000-ton line at the end of 1963 (both lines by Wean Engineering Co., United States).[6] The domestic market was estimated to be only about

---

[5] Fernandez, Juanito C. Geology of the Lammin Iron Deposit, Piddic, Ilocos Norte. Philippine Bureau of Mines Rept. of Inv. 52, February 1964, 11 pp.

[6] Bureau of Mines. Mineral Trade Notes. V. 59, No. 3, September 1964, pp. 56–57.

60,000 tons so there should be some tin plate for export. Duty rates on imported tinplate that went from 15 to 30 percent ad valorem in February served to protect the industry. Tariffs on other goods were discussed: House Bill 5560 sought to reduce tariffs on imported steel sheets and plates from 15 to 5 percent and raise duties on galvanized iron sheets from 15 to 75 percent; however, the House Bill met strong resistance. The Philippine Finance Department late in the year imposed penalties for dumping of wire rods imported from Japan and iron pipe from Taiwan.

Manganese.—Acoje Mining's Sierra Madre property, Isabela Province, produced its first commercial ore in the third quarter of 1964 and shipped ore to Japan from Diapitan Bay. The deposit with 200,000 tons proven reserves averaging 44 percent manganese and 6 percent iron was to be mined over a 3-year period. Value of shipments was averaging $25.60 per ton. Philippine Manganese, Inc., produced a few hundred tons of battery-grade ore for the domestic market.

Mercury.—Palawan Quicksilver Mines, Inc., the lone producer, studied ways to predry its mill feed. Mining cutoff grade was down to 2.5 pounds of mercury per ton, and mill heads in 1964 averaged a little over 3 pounds per ton. Domestic markets accounted for about one-fifth of the output and most of the rest was exported to the United States. Total production from startup in 1955 to yearend 1964 was 27,900 76-pound flasks.

Nickel.—Passage of the amended Nickel Law renewed interest in mining nickel deposits in the Government's Surigao del Norte Reservation, Mindanao, where nearly 500 million tons of laterite and decomposed serpentine lie in deposits 18 to 30 feet thick, estimated to contain 0.88 to 1.11 percent nickel, up to 47 percent iron and almost 0.1 percent cobalt. Because of the probable $150 million or higher investment required, the amended law which encourages joint venture was an important step toward possible development. United States, Canadian, and Japanese firms were expected to bid for mining rights before the May 1965 filing deadline set by the Surigao Mineral Reservation Board. Potential U.S. investors, exempted from a constitutional provision requiring 60 percent Philippine ownership in such joint ventures, had an advantage.

NONMETALS

Cement.—1964 was a growth year for cement; Filipinas Cement Co. began production in June (initially 100,000 tons per year with plans to double), Mindanao Portland Cement Co. (150,000 tons), was to follow later in the year, and San Jose Cement Corp. was nearing production stage. At least seven companies had proposals for other plants. Marinduque Cement Co., subsidiary of Marinduque Mining & Industrial Corp., signed a contract to build a 0.4-million-ton plant near Manila; Tayabas Cement Co., Inc., contracted for a $7 million plant; and Hi-Koppers Cement Co. (half-financed by the Pittsburgh, Pa., firm, Koppers Corp.), planned plants at Norzagaray, Luzon, and on Mindanao totaling 0.85 million tons of capacity. Eight companies with as many plants were expected to produce 1.8 million tons of cement in 1965. Continued import of cement was strongly opposed by domestic producers on grounds of foreign exchange loss, possible dumping by foreign suppliers, and belief that output would soon satisfy demand.

Fertilizer and Pyrite.—Utilizing pyrite from the Toledo deposit, Atlas Fertilizer Corp. made efforts to boost sulfuric acid production after it was unable to satisfy combined needs of fertilizer and sugar industries in 1963. Marcelo Fertilizer Corp. planned to expand its Iligan, Mindanao, fertilizer plant and build two others, one each on Negros and Luzon. The $30 million 1,200 ton-per-day ESSO Standard Fertilizer & Chemical Co., Inc., plant under construction at Limay, Bataan was due on stream in late 1965. Marinduque Mining was preparing to supply pyrite for acid from its Bagacay deposit and diatomaceous earth from another source, Bataan Refinery Corp. (ESSO-Mobil subsidiary) supplying refinery gas.

MINERAL FUELS

Coal.—Coal was of little importance as a fuel; it was mined chiefly at two locations providing fuel for cement manufacture on Cebu Island and for power and domestic use in Zamboanga del Sur, Mindanao. Malangas coal was studied for domestic steelmaking, but coking properties fell short of competitive import coals.

Petroleum.—Imported crude oil supplied the four Philippine refineries and satisfied most of the growing demands for oil products. Oil explorations were largely unsuccessful, but a few companies continued to probe favorable structures. Mobil Philippines Exploration, Inc., drilled 5,000 to 10,000 feet in the Cebu-Visayan Sea area; Republic Resources Development Co., Inc., started holes in the Alegria area, southern Cebu; Union Oil Co. went more than 11,000 feet in the Central Luzon Valley; and Mobil Oil Co. explored on Guintacan Island. A group of companies signed a contract to explore for oil in Western Leyte, and applications came in for offshore concessions in the Sulu Sea near North Borneo. Ten-year limits on concessions caused some discouragement, and at least two major operators prepared to pull out as lease expiration dates approached.

The Mineral Industry of Taiwan

By Benjamin H. Lim[1]

◆

TAIWAN'S 1964 mine production index was 7 percent greater than that of 1963 and 12 percent over the 1962 figure. The increase was chiefly the result of greater natural gas output. Total value of mine output in Taiwan for 1964 was $60 million[2] or about 3 percent of the gross national product. Increases were significant considering that the island is poor in minerals. Among the few minerals mined, coal, gold, silver, sulfur, and natural gas were the leading mineral products in terms of value, although none had economic importance by world standards. Despite the lack of domestic raw materials to supply the increasing needs of the island's expanding industrial sector, Taiwan continued to make significant strides in achieving a more balanced economy.

Production of natural gas and natural gas products increased greatly in 1964 as a result of the development of deposits discovered in the preceding 2 years. Several ammonia-urea plants have been completed recently, and together with other fertilizer manufacturing facilities, now either in the process of construction or planned, will contribute to increased agricultural production to support the industrialization program. Tentative plans have been made to supply natural gas to households if and when industrial consumption is satisfied.

Cement production increased about 5 percent over that of 1963, and about 1 million tons was exported mainly to southeast Asian countries. Among the free world Far Eastern countries, Taiwan ranked second only to Japan in cement production. Output of aluminum based on bauxite imports from southeast Asian areas nearly doubled in 1964; the industry's products are competitive in world markets. In 1964 the industry was near capacity production at 20,000 metric tons. Plans have been made to expand the industry's sheet capacity to 11,000 tons by yearend 1964.

GOVERNMENT POLICIES AND PROGRAMS

On November 16, 1964, the Taiwan Provincial Government (TPG) established the Taiwan Land Development Corporation as an entity through which industrial zones can be established and as an agency for implementing land reclamation projects. The newly formed corporation initially established three projects which at yearend were in varying stages of implementation. These were the Tingken Area in Taipei's western suburbs, the Kueishan Area near Taoyuan, and the Toufen Area in Miaoli County. These projects had a total area of about 175 acres. In addition, the TPG selected 56 other sites for possible designation as industrial parks. These additional sites were to be developed either by local governments or by the Provincial Government.

---

[1] Physical scientist, Division of International Activities.

[2] Throughout this chapter, the monetary unit used is the U.S. dollar, rather than the new Taiwan dollar (NT$).

On December 22, 1964, the Legislative Yuan revised the Statute for the Encouragement of Investment. The chief aim of the revision was to speed up the island's industrialization. Such an accelerated program was needed at the time because of the impending expiration of U.S. economic aid to Taiwan in July 1965. The main effect of the revised statute will be to transfer as many government-owned businesses as possible to private ownership through the sale of shares in the local markets. The sale proceeds will be used to build new plants that involve large amounts of capital. The transfer of ownership via shares will enable the central government to continue control of an enterprise if required.

Some of the more important provisions in the revised statute provide that steel, machinery manufacturing, petrochemicals, and other key and heavy industries deemed vital to Taiwan's economic development will be permitted to import capital equipment duty free, provided that the equipment cannot be manufactured locally and that the total capital expenditure of the project will not exceed the equivalent of $750,000. The revised statute encourages large-scale production by promoting the merger of small enterprises with the incentive that the amalgamated firm will pay no income tax, stamp tax, or deed tax for such merged firms. Finally, the revision will help expand export industries by exempting business tax from industrial and commercial firms that sell export commodities, handle exports, purchase raw materials for export processing, engage in export shipment, or render export services of any type.

PRODUCTION

Cement and coal, Taiwan's chief mineral products, were valued at about $40 million each in 1964, about the same as in 1963. Iron and steel product output, with an estimated $25 million, increased slightly over last year's level. New fertilizer plants completed during the latter part of 1963 and early in 1964, boosted output value of these commodities from about $30 million to $35 million in 1964, compared with about $25 million in the previous year. Fertilizer production increases were made possible by increased natural gas output. Value of natural gas output in 1964 has been placed at approximately $2.5 million. Aluminum output in 1964 was at near capacity production with increases made chiefly in ingots and sheets, resulting from expansion of old facilities and construction of new ones. Gold output continued a downward trend during 1964, reportedly because the rich gold ores, discovered in 1962, were rapidly diminishing. Taiwan sulfur output declined because the domestic production was not competitive with sulfur produced elsewhere.

TABLE 1.—Taiwan: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum ingots	8,261	9,016	[r] 11,009	11,928	17,749
Copper:					
Ore, 0.61 to 0.77 percent Cu	192,062	195,900	166,849	117,618	119,973
Concentrates, 13 to 14 percent Cu	[e] 10,000	10,922	12,167	8,272	9,291
Mine	2,100	2,232	2,107	1,619	780
Cement, 30 to 40 percent Cu	1,687	1,710	[e] 1,700	[e] 1,500	[e] 1,500
Electrolytic copper	1,780	2,268	2,491	1,481	1,605
Gold:					
Gold-copper ore [1]	157,024	189,503	196,433	170,392	200,494
Gold ore (1.50 ounces Au per ton in 1964)	37,308	NA	NA	[r] 1,553	1,483
Refined gold ... troy ounces	[r] 15,702	[r] 17,619	[r] 24,026	31,710	17,660
Iron and steel:					
Iron ore:					
Limonite, 35 percent Fe	NA	557	515	576	1,021
Magnetite, 50 percent Fe	8,143	12,488	5,814	4,705	5,877
Pig iron ... thousand tons	24	53	63	54	62
Steel ingots and castings ... do	200	[e] 170	182	275	300
Rolled steel ... do	NA	NA	NA	NA	260
Silver ... troy ounces	52,579	77,303	80,129	61,440	60,636
Nonmetals:					
Asbestos	440	40	476	548	477
Cement ... thousand tons	1,183	[r] 1,510	[r] 1,870	[r] 2,239	2,355
Clays:					
Ceramic and pottery ... do	[e] 40	40	40	40	40
Paper filler ... do	3	3	3	3	3
Used in cement ... do	183	207	372	460	471
Brick and tile ... do	[e] 500	500	500	500	500
Total	[e] 726	750	915	1,003	1,014
Dolomite, about 19 percent MgO	15,008	22,182	29,837	30,904	32,684
Graphite, 20 to 70 percent fixed carbon, amorphous	300	133	[e] 300	[e] 300	[e] 300
Gypsum, 75 to 96 percent gypsum	10,629	11,934	16,285	26,588	17,094
Lime	44,105	[r] 75,918	[r] 75,123	[r] 79,491	91,275
Limestone ... thousand tons	2,073	2,479	3,292	3,680	3,717
Used in cement ... do	1,556	2,021	2,418	2,899	2,905
Pyrites, 25 to 45 percent sulfur	42,997	47,467	45,490	46,760	46,324
Salt, sea ... thousand tons	[r] 408	[r] 453	595	626	602
Sand, glass ... do	53	40	68	80	94
Sulfur:					
Refined, 97 to 99 percent sulfur	4,874	5,560	7,582	7,259	6,492
Contained in pyrites	[e] 15,000	[e] 16,600	[e] 16,000	[e] 17,200	17,081
Recovered from refinery gases, 99 percent sulfur	890	2,000	2,164	2,347	2,825
Total	[e] 20,800	[e] 24,200	[e] [r] 25,700	[e] [r] 26,800	26,398
Talc, mostly soapstone grade	10,557	[r] 13,448	13,409	14,787	16,981
Mineral fuels:					
Coal, subbituminous to high-volatile bituminous:					
Dust and lump ... thousand tons	2,992	3,220	3,618	3,878	3,978
Coking ... do	970	1,017	936	932	1,050
Total ... do	3,962	4,237	4,554	4,810	5,028
Coke:					
Coke oven and beehive (including semicoke) ... thousand tons	193	200	109	199	85
Gas plants ... do			119	34	160
Natural gas ... million cubic feet	[r] 898	[r] 1,309	[r] 1,356	[r] 1,789	[r] 5,982
Petroleum:					
Crude ... thousand 42-gallon barrels	14	17	14	19	61
Refinery products:					
Gasoline ... do	1,880	1,970	2,001	[e] 2,040	2,170
Kerosine ... do	22	22	24	[e] 25	250
Jet fuel ... do	NA	NA	NA	NA	1,390
Distillate fuel oil ... do	1,362	1,453	1,609	[e] 1,420	1,717
Residual fuel oil ... do	2,663	2,916	3,578	[e] 3,830	3,944
Asphalt ... thousand tons	47	61	68	[e] 56	40

[e] Estimate. [r] Revised. NA Not available.

[1] Average grade about 0.1 ounce gold per ton, 3.2 ounces silver per ton, 0.3 percent copper and 5 percent sulfur.

TRADE

Value of 1964 mineral imports, estimated at $60 to $65 million, was about 20 percent of the total import value whereas that of mineral exports, valued at about $32 million, was approximately 11 percent of the total export value. Crude petroleum and iron and steel products made up about two-thirds of the total imports. Fertilizers and sulfur imports comprised about another 19 percent of the total. Taiwan has been nearly self-sufficient in nitrogenous fertilizers since the newly constructed ammonia-urea plants went into operation during the latter part of 1963. However, it still had to import phosphatic and potassic fertilizers, mostly from the United States and Japan, because of the lack of raw materials. Part of the import expenditures were defrayed by funds of the U.S. Agency for International Development.

Japan and the United States remained Taiwan's chief trading partners in 1964. Imports from Japan, about 38 percent of the total value, were mostly metals and industrial equipment. Imports from the United States, about 22 percent of the total value, were chiefly agricultural products, scrap metals, vehicles, and capital goods. The Middle East supplied nearly all of Taiwan's crude petroleum requirements. Malaysia provided nearly all the iron ore; the Sarawak part of Malaysia supplied bauxite; and Canada supplied sulfur.

TABLE 2.—Taiwan: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Aluminum and alloys:			
Unwrought	2,626	3,431	South Korea 917; United States 800; Netherlands 550; United Kingdom 457.
Semimanufactures	1,510	2,926	South Viet-Nam 1,207; Japan 540; India 466.
Copper:			
Ore and concentrate	12,800	3,400	All to Japan.
Semimanufactures	4,420	315	South Viet-Nam 167; United States 113; Hong Kong 33.
Iron and steel:			
Pig iron	1,879	3,211	South Africa 3,061; Malaya 100; Philippines 50.
Ingots	[r] 35	----------	
Semimanufactures thousand tons	54	84	South Viet-Nam 57; Hong Kong 9; Philippines 5; United States 4.
Ferroalloys	590	3,803	South Korea 3,800.
Nonmetals:			
Cement:			
Hydraulic thousand tons	488	892	South Viet-Nam 413; Philippines 194 Hong Kong 176.
White	5,029	7,164	South Viet-Nam 5,085; Philippines 1,754; Hong Kong 270.
Fertilizers, chemical	15,327	15,558	South Viet-Nam 15,480; Ryukyu 65.
Salt thousand tons	237	283	Japan 222; South Korea 48; Ryukyu 8; Malaya 5.
Mineral fuels:			
Coal thousand tons	128	92	Japan 49; South Korea 37; Hong Kong 6.
Coke, petroleum and other	3,498	4,777	Singapore 1,102; Hong Kong 998; Philippines 980; Malaya 757.
Petroleum:			
Gasoline, naphtha, and benzine thousand tons	27	----------	
Fuel oil do	[r] 33	51	Hong Kong 40; United States 11.
Pitch and asphalt do	37	28	South Korea 23; Hong Kong 1; British North Borneo 1.

[r] Revised.

Cement as well as iron and steel products were Taiwan's leading exports during 1964. Cement exports in 1964 alone earned Taiwan approximately $16 million in foreign exchange, about one-half of the total value of mineral exports. Most of the cement and iron and steel was exported to South Viet-Nam and to Hong Kong. Coal, mainly coking grade, went to Japan and South Korea.

TABLE 3.—Taiwan: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys:			
Unwrought	333	1,345	India 1,107; United States 188; United Kingdom 25.
Semimanufactures	119	116	Japan 62; United States 40; West Germany 3.
Bauxite	57,185	53,013	British North Borneo 36,991; Malaya 15,622.
Chromium ore and concentrate	250	159	Japan 99; Philippines 10.
Copper and alloys:			
Unwrought	2,443	2,286	Japan 1,454; United States 807; Portuguese East Africa 25.
Semimanufactures	707	932	Japan 895; United States 31.
Iron and steel:			
Ore and concentrate	10,452	43,711	Malaya 31,423; Philippines 5,771.
Billets, blooms, and other unwrought products.	11,132	1,010	West Germany 996; Japan 14.
Semimanufactures. thousand tons	156	173	Japan 140; United States 26; Australia 5.
Ferroalloys	609	126	Japan 80; West Germany 40; United Kingdom 6.
Scrap thousand tons	113	174	United States 87; Hong Kong 11; Australia 6.
Lead and alloys:			
Metal	1,903	2,521	Australia 1,400; Hong Kong 480; Canada 300.
Semimanufactures	25	127	West Germany 125; Australia 52; Japan 11.
Mercury 76-pound flasks	261	290	Mexico 20; Japan 29.
Nickel:			
Ingot and other primary forms	101	180	Canada 164; United States 14; France 2.
Semimanufactures	4	3	United States 2; Japan 1.
Tin and alloys, semimanufactures. long tons	164	185	Malaya 184; Singapore 1.
Titanium dioxide	534	791	Japan 543; United States 168; West Germany 32; United Kingdom 22.
Zinc:			
Unwrought	3,048	3,800	Australia 2,893; West Germany 660; Canada 90.
Semimanufactures	270	148	West Germany 81; United States 45; Japan 12; Belgium 10.
Nonmetals:			
Abrasives	655	588	Japan 478; United States 100; Netherlands 8.
Asbestos	1,423	1,142	Canada 519; Japan 195; South Africa 153.
Fertilizers:			
Ammonium sulfate	235,265	107,400	All from Japan.
Nitrogenous	73,133	85,202	Do.
Phosphatic	6,158	17,834	All from United States.
Potassic	[r] 50,678	47,480	West Germany 35,970; Belgium 10,500; Japan 1,000.
Graphite:			
Plumbago	1,570	1,852	South Korea 1,739; Japan 102.
Other	51,973	119,695	Morocco 106,411; Japan 5,108; Australia 2,050.
Gypsum	35,991	22,620	Cyprus 15,500; Australia 1,000.
Sulfur	15,497	40,413	Canada 39,712; United States 700.
Mineral fuels:			
Coke, petroleum and other	10,136	7,209	All from United States.
Petroleum:			
Crude oil thousand tons	1,259	1,494	Iraq 1,386; Kuwait 108.
Lubricating oil thousand 42-gallon barrels	171	94	United States 62; Japan 32.
Lubricating grease	1,065	368	United States 250; Japan 118.
Paraffin wax	1,876	1,865	United States 1,441; Indonesia 234.
Pitch and asphalt	3,712	2,775	United States 2,194; Japan 580.

[r] Revised.

COMMODITY REVIEW

METALS

Aluminum.—In 1964, Taiwan's aluminum industry, the only one with a reduction plant among the smaller Far Eastern countries, was almost at peak production, achieving a new high in ingot output, 60 percent over that of 1963. Aluminum sheet production was approximately 8,000 tons in 1964, an increase of 40 percent over the 1963 record, and output of semifabricated and fabricated aluminum products was 5,000 tons, a 14-percent gain over that of 1963. Expanding production was attributed to heavy demands from both foreign and domestic sources.

Taiwan's lack of domestic aluminum ore to supply the rapidly growing requirements have and will necessitate bauxite imports, which, through 1964, came mainly from Sarawak part of Malaysia, India, and other southern Far Eastern countries. In 1964, approximately 90,000 to 100,000 tons of bauxite was imported.

In 1964, Taiwan Aluminum Corp. (TALCO), expanded and modernized its electrolytic line in its Kaohsiung plant by adding 26 new 100,000-ampere, vertical-stud type pots of Péchiney design. With a total of 86 potlines in operation at yearend 1964, TALCO has raised the annual aluminum ingot capacity of its fully integrated facilities to 20,000 tons. The firm made plans for expanding smelting capacity in anticipation of greater demand. TALCO continued to supply a number of independent Taiwanese fabricators with both ingots and semimanufactures as raw materials. Accordingly, TALCO began in mid-1964 to increase its rolling and fabricating facilities. Plans call for an initial investment of $5 million to finance both construction of new plant facilities and the purchase of machinery and equipment, all to increase the firm's annual production capacity of aluminum sheets from the present 7,000 tons to 10,500 tons and that of finished aluminum products to 5,900 tons. Completion of these projects was scheduled for late in 1966 or early in 1967. Further expansion was evidenced by a contract signed early in 1965 by the Central Trust of China, Taiwan's procurement agency, and Schloemann A. G. of West Germany for purchase of a rolling mill capable of producing annually 15,000 tons of aluminum sheets and plates.

The aluminum industry earned about $5 million in foreign exchange in 1964, when approximately 12,000 tons of ingots and 3,000 tons of finished products were exported. Major foreign buyers were Hong Kong, the Ryukyus, South Korea, and Thailand. Domestic consumption takes about 7,000 to 8,000 tons of aluminum ingots and sheets a year.

Copper, Silver and Gold.—Taiwan's gold output in 1964 was less than one-half of the planned production of 33,000 ounces. The diminished 1964 production may be attributed to the erratic nature of the gold content of the ore. Silver production from the polymetal ore during 1964, however, was slightly above last year's level. Output of electrolytic copper, also derived from the polymetal ore, was about the same as in 1963 but was about 900 tons less than the expected production of approximately 2,500 tons.

Three mines, Chinkuashih, Chiufeu, and Wutankang, produced more than 95 percent of the total gold output in 1964. Of these, the Chinkuashih mine, east of Keelung Harbor, is the largest and the most productive. Rich gold ore shoots discovered in 1962 were near exhaustion in 1964. The Chiufeu and Wutankang mines were also nearly exhausted of high-grade ore. Total reserves at the three major mines have been estimated at about 10 million tons of ore, averaging 0.1 ounce gold per ton, 3.2 ounces of silver per ton, and four percent copper.

Iron and Steel.—Output of iron and steel ingots and castings in Taiwan in 1964 increased about 9 percent with respect to that of 1964, reflecting a continuation of good sales conditions on both domestic and foreign markets. The island's iron and steel industry, comprising 51 firms, had an estimated total annual capacity of 400,000 tons of salable materials, including 60,000 tons of pig iron, 275,000 tons of sheets, plates, bars, and other structural steel, and 55,000 tons of iron and steel wire, in addition to facilities to produce pipes, nails, and other products.

Although most of Taiwan's iron and steel industry remained privately owned, the largest firm, Tang Eng Iron Works (annual capacity nearly 100,000 tons), has been held by the government since 1960 when the previous owner became insolvent. Other more important steel industry firms in 1964 were Taiwan Machinery Manufacturing Corp., Taiwan Iron Manufacturing Corp., and Kwanghua Machinery Manufacturing Corp.

Because of anticipated increased demands, a number of steel firms have launched modernization and expansion programs. Taiwan Iron placed an order with the Nisho Machine Co. of Japan for steel plate rolling equipment following the company's recent increase of capital from $1.2 million to $2.5 million. In early 1964, Mitshubishi Shoji shipped a 1,500-ton-per month galvanizing plant to Taiwan, based on expected continued growth in markets for galvanized sheet and wire. In 1964, Taiwan imported about 3,800 tons of galvanized steel per month, about 600 tons per month more than in 1963. Mitsui Bussan was expected to ship a tinplate plant to Taiwan late in 1964 or early in 1965.

In November 1964, a five-man West German steel industry survey team arrived in Taiwan to study the feasibility of establishing an integrated steel mill. The team, headed by Dr. Herman Jung, a specialist on raw materials supply, was from the Kloeckner Industrie-Anlagen G.m.p.h. of West Germany.

Taiwan's lack of important economic iron ore deposits has forced the island's iron and steel industry to import its metallic raw materials. It has imported iron ore at an annual average rate of about 40,000 tons, chiefly from Malaya and about 200,000 tons of metal scrap a year, valued at $7 to $8 million, mostly from the United States, Hong Kong, Malaysia, and Australia. Scrap imports have supplied about one-half of Taiwan's steel industry's annual requirements.

Taiwan's exports of steel semimanufactures, valued at over $14 million in 1964, have increased steadily during the last decade; in 1953, value of such exports was less than $1 million. A large share of these commodities has been exported to South Viet-Nam, Hong Kong, Malaysia, Thailand, and the Philippines.

NONMETALS

Cement.—Cement production increased about 11 percent over the 1963 level. Despite fears of overproduction expressed early in the year, unexpected heavy domestic and foreign demand dispelled the early gloomy outlook and gave the Taiwan cement producers a buoyant optimism reflected in plans of the larger manufacturers to expand their plant facilities and establish foreign subsidiaries.

At yearend there were about 12 cement plants in Taiwan with a total annual capacity in the neighborhood of 2.4 million tons. Six plants have each an annual capacity of over 180,000 tons. Taiwan Cement Corporation's four plants accounted for more than 50 percent of the island's total cement production in 1964. Other major cement producers in order of their size were Chiahsin Cement Corp., Asia Cement Corp., and Universal Cement Corp. These four firms have regularly accounted for over 90 percent of Taiwan's annual production.

Most of Taiwan's cement plant equipment has been of U.S. manufacture. Asia Cement's modern installation, designed and equipped by the U.S. engineering and construction firm, Burns and Roe, Inc., New York, consists of two automated and integrated producing units, with a capacity of 435 tons of cement per day. Taiwan's cement industry has launched a more comprehensive research program to improve the industry's products. Past research efforts have enabled the Taiwan cement producers to exceed international standards by a substantial margin while remaining competitive in world markets, contributing to the growth rate of the island's cement industry which has averaged about 16 percent since 1953 compared to 12 percent for general industries.

Approximately 60 percent of the total production was consumed domestically in 1964. On a per capita basis, cement consumption was exceeded only by that of Japan in the Far East. In addition to supplying the domestic market, the Taiwan cement industry has enjoyed increasing foreign markets. Since 1958 Taiwan has moved from sixth to fourth largest cement exporting country in the world. Taiwan's cement exports constituted about 5 percent of the total value of all exports in 1964. Thus, cement was one of the important products in earning foreign exchange, which Taiwan needed both to balance imports and to promote the island's economic programs. Taiwan's major foreign customers of cement in 1964 were Malaysia, the Philippines, Hong Kong, South Korea, and South Viet-Nam. These countries however are soon expected to become self-sufficient in cement and in anticipation of this possibility, Taiwan cement manufacturers are seeking other markets.

Sulfur, Pyrites, and Fertilizers.—Production of refined sulfur from native sulfur ore increased about 38 percent in 1964 compared with the 1963 output. A small quantity of sulfur also was recovered from refinery gas. Three major sulfur producers, Takkee Mining Co., San Chiu Mining Co., and San Li Mining Co., accounted for more than 90 percent of the total output. Pyrites was a more important source for sulfur than refinery gas. In 1964, approximately 45,000 tons of pyrites was roasted to produce 16,000 tons of sulfur. Pyrite output was more than 5,000 tons below the level expected early in 1964, because imported materials were available at lower prices. For example, the Kaohsiung Ammonium Sulfate Corp. (KASC) purchased 20,000 tons of Canadian sulfur at $23.79 per ton delivered, compared with 4,000 tons of sulfur from Takkee Mining Co. at a price of about $65.74 per ton. In 1964, 60,000 tons of sulfur were imported, compared with 40,500 tons in 1963, an increase of nearly 50 percent to meet growing demands.

Production of chemical fertilizers was as follows:

Fertilizer	Thousand metric tons	
	1963	1964
Calcium cyanamide	64	50
Nitrochalk	55	60
Nitrophosphate	--------	25
Ammonium sulfate	108	150
Urea	76	137
Calcium Superphosphate	172	140
Total	475	562
Nitrogen equivalent	81	121
P_2O_5 content	31	29

The new ammonia-urea complex of Mobil China Allied Chemical Industries, Ltd. (MCAC), at Miaoli was completed in December, 1963, despite lengthy delays caused by summer typhoons of 1962 and 1963. The prime contractor for the industrial complex was the Badger Co. of Cambridge, Mass. The plant uses natural gas from the Chin Shui gasfield as the main raw material and has an annual rated output of 106,000 tons of ammonia. Part of the output went into manufacturing 100,000 tons of urea. Plans called for the sale of all of its production to Taiwan Fertilizer Co. (TFC), a government-owned enterprise.

TFC, the leading producer of chemical fertilizers in Taiwan had seven plants with production capacities ranging from 8,600 to 75,000 tons a year. Total estimated annual production capacity was 400,000 tons at the start of 1964. In mid-1964, TFC increased its capacity by building a new 120,000 ton ammonium sulfate facility at one of its plants. Taiwan's second largest fertilizer producer was the Kaohsiung Ammonium Sulfate Corp., which operated two plants producing ammonium sulfate and ammonia at a rated total capacity in excess of 110,000 tons a year. Mobil China Allied Chemical ranked third. Estimated production of this firm in 1964 was 65,000 tons of urea.

To spur Taiwan's argicultural production, the Central Taiwan Government planned to build a $30 million urea plant capable of producing 600 tons of fertilizer a day.[8] When this plant goes into operation about 1966, Taiwan's annual production rate will be about 800,000 tons, sufficient to meet anticipated domestic needs with an excess for export.

Total domestic demand for chemical fertilizers averaged 650,000 tons annually between 1954–64. Prior to 1950, more than half of Taiwan's requirements were met by imports, mostly from the United States and Japan, but after that year, domestic production climbed steadily. The discovery of extensive natural gas reserves was a great aid to the industry. By yearend 1964, nitrogenous fertilizer production reached a record high of 560,000 tons, slightly short of current requirements. On account of lack of domestic raw materials, Taiwan still had to import 82,000 tons of potash fertilizers annually.

---

[8] Far Eastern Economic Review. Urea for Gas. V. 45, No. 8, Aug. 20, 1964, pp. 351–353.

MINERAL FUELS

Coal.—Coal production for 1964 increased slightly over the 4.8 million tons produced in 1963. Before the discovery of additional natural gas, coal was the only mineral fuel of economic value in Taiwan and accounted for nearly 80 percent of the total value of the mining industry. Coal's dominant position in the mining industry, however, was in jeopardy owing to the decline of known high-grade reserves, which were estimated to be about 200 million tons. This amount is inadequate to meet the mounting demands of Taiwan's growing economy as it steadily shifts from agriculture to industry. At a projected annual rate of consumption of 7.5 million tons by 1973, Taiwan's known coal reserves will not last beyond the current century.

Almost all the coal mines are located in northwestern Taiwan, where more than 70 percent of the coalbeds are in Keelung and the Taipei coal regions. At yearend 1964, there were approximately 300 individually operated coalfields in Taiwan. Only 10 percent of the fields, however, has any sizable operation and only one mine has production exceeding 3,000 tons per month. To increase efficiency and safety, some of the operators in 1964 improved the ventilation of their mines greatly, replaced wooden posts with concrete supports and issued proper gear to the miners. Mechanization and coal-washing facilities also have been introduced to some of the mines.

Most of the coal production in 1964 was channeled to power plants. Taiwan Power Co., the largest coal consumer on the island, consumed about 1.6 million tons in 1964, nearly a third of the total production. Exportable surplus continued to decline and did not exceed 200,000 tons in 1964. Consensus was that in the near future, Taiwan will no longer have coal for export, and that, instead, consumption may exceed production because of increasing domestic needs. In anticipation of this demand, Taiwan's Mining Research and Service Organization (MRSO) has intensified its program of coal research and exploration. Production capacities of existing coal mines reached their peaks in 1964, while requirements continued to climb steadily.

Natural Gas.—Taiwan's significant increase in natural gas production in 1964 was due chiefly to exploitation of large reserves discovered previously at lower depths in the Chinshui gasfield, the Chuhuangkeng oilfield, and the Tiehchenshan area. By yearend 1964, there were altogether 17 natural gas wells in Taiwan: 10 in Chinshui, 2 in Chuhuangkeng, and 5 in the Tiehchenshan area. Total daily output potential has been placed at 50 million cubic feet, but actual output was regulated to meet current demand, about 30 percent of the potential. Heretofore, demand had been limited by the supply, but the new reserves will permit not only expanded use of gas as fuel, but more importantly, use of gas as a raw material for a petrochemical industry.

The petroleum and natural gas industries in Taiwan remained under the management of the Chinese Petroleum Corp. (CPC), a firm under direct supervision of the Ministry of Economic Affairs. The firm has the responsibility for all phases of the oil industry—exploration, production, refining, transportation, and marketing. To transport natural gas to Taiwan's industrial centers, CPC invited a U.S. engineering firm to study the technical aspects of laying a pipeline from the wells to these centers, and in December 1964, the central Taiwan Government authorized CPC to issue $2.5 million worth of corporate bonds to finance the construction of the proposed pipeline. Reportedly, pipeline construction will be coordinated closely with the development of the gas wells in Chinshui, Tiehchenshan, and Chiting. Plans call for the initial section of the pipeline to link Miaoli to Hsinchu; in the future, it may be extended to the northern areas of the island.

According to latest estimates, total natural gas reserve was in the neighborhood of 650 billion cubic feet, two-thirds in the Tiehchenshan area and most of the remainder in Chinshui. These two fields are near Miaoli, midway between Taipei and Taichung.

Two of the major consumers of natural gas in 1964 were Mobil China Allied Chemical Industries, Inc., and the Chinshui Natural Gas Plant. Mobil China Allied used the gas to produce ammonia and urea for fertilizer production. The Chinshui Natural Gas Plant, a subsidiary of CPC, used gas to produce liquefied gas and gasoline. It was expected that once industrial demand is satisfied, CPC will begin to satisfy household demand by laying a network of pipelines to major cities.

Petroleum.—The threefold increase in crude oil production in Taiwan in 1964 was closely related to intensified exploitation of natural gas. However, annual indigenous output was sufficient only to supply the island's refinery for little over a day and met only a minute fraction of Taiwan's 5 million barrel-per-year requirement for refinery products. Most of the product needs were met by refining imported crude oil, nearly all from the Middle East, in Taiwan's Kaohsiung refinery. Of the total requirements, automotive gasoline, fuel oil, and lubricants constituted about 86 percent, and bunkers accounted for the remainder. Product imports were confined chiefly to specialty products.

The Kaohsiung refinery, started in 1954, was under expansion in 1964, with a petroleum coke plant and a lubricating oil plant (a joint venture between CPC and Gulf Oil Co.) under construction at yearend, due for completion early in 1965. Existing capacity was 40,000 barrels of crude petroleum daily, and processing facilities included the following (capacities given in barrels per day): Catalytic cracking—10,000; catalytic reforming—5,000; vacuum distillation—2,000; unifining—5,5000; alkylation—900; asphalt production—1,400; and visbreaking (a process to improve fuel oil and lubricating oil feedstock)—5,000.

Approximately 30 percent of the Kaohsiung refinery's production has been exported, earning more than $10 million annually in foreign exchange. Gasoline has been exported mainly to the Philippines. Substantial quantities of fuel oil have been sold to the United States 7th Fleet. Asphalt has been shipped to South Korea, Thailand, the Philippines, and Hong Kong.[4]

---

[4] Jones, P. H. M. Oil: Dream Refinery. Far Eastern Economic Review, v. 46, No. 6, Nov. 5, 1964, pp. 320–321.

The Mineral Industry of Thailand

By J. M. West[1]

⁂

THE mineral industry continued to rank a poor second to agriculture in its contribution to Thailand's gross national product (GNP) in 1964. Mineral output value was only 2 to 2.5 percent of the estimated \$3.2 to \$3.4 billion[2] GNP, but minerals accounted for 8 to 10 percent of the value of the nation's exports. Tin, traditionally the leading product, brought in one-third more income in 1964, although output was only slightly higher than in 1963. Production was expected to show greater advance in 1965 with continuing favorable price incentives. Tin production was about 11 percent of free world and 8 percent of total world output in 1964. Toward yearend construction started on Thailand's first sizable tin smelter, and tin ore sales came under restrictions. An iron mine opened near the Thai-Malayan border; iron deposits in the Loey area of the north were studied as a possible base for a steel industry. In the steel industry, pipe and galvanized sheet plants and a foundry were under construction or completed, and a reversing mill was planned. Outputs of both fluorspar and antimony in 1964 increased to about 3 percent of world totals. A medium-sized oil refinery went into operation at Sriracha; oil prospecting continued in the northeast, and offshore oil concessions were eagerly sought.

Development of the nation's transportation and power infrastructure contributed to steadily improving conditions for the Thai mineral industry. Electric power began flowing from the Yan Hee hydroplant in the north, and a lignite thermal plant began operating at Krabi in the south. The country's fourth cement plant was under construction in the south at Tungsong. The nation's mineral resource position was becoming stronger; large undeveloped salt deposits in the Khorat region and potentially sizable iron, zinc, lead, and manganese deposits have been discovered. Prospects for discovery of oil, and offshore tin mining seemed promising, and production of tin, tungsten, fluorspar, and antimony will probably increase.

GOVERNMENT POLICIES AND PROGRAMS

The Government's fundamental policy was sympathetic and encouraging to private investors, both domestic and foreign; the Industrial Investment Promotion Act of 1962 that granted special benefits to priority industries continued in force.[3] Although the mineral resources have not been developed, the possibilities for development are good because Thailand has political stability, sound money, and a favorable outlook for economic growth. A 6-year plan, revised in the second half of 1964 to a 3-year plan (1964–66), was quite successful. The revised plan envisoned expenditure of nearly $1 billion on projects involving capital formation to accelerate economic development, one-third of the funds to be supplied from public investment and two-thirds from private investors. The Government was restudying proposals by several companies to establish a major steel mill in Thailand. This project was considered extremely important because of increasing foreign exchange costs for steel.

---

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from the Thailand baht (B) at the rate of B20.8=US\$1.

[3] Department of Mineral Resources, Bangkok. Facilities Granted to Foreign Investors Under Exchange Control Regulation. Thai Mineral Resources Gazette, v. 9, No. 4, April 1964, pp. 40–44.

The Thai mining industry was expanding with Government encouragement. Both private and public sectors required more modern and dependable equipment, and the Government considered making public funds available on loan to miners for the purchase of machinery. Sales of excavating and mine safety equipment were estimated at about $10 million in 1964 and were expected to increase.

Highway construction and power generation had high priority in Government plans. Road construction in southern Thailand was to be aided by a Japanese equipment pool being set up at Songkhla. The Highways Department signed an engineering contract for a new Bangkok-Sriracha highway with a loan of $19 million from the Export-Import Bank. An $80 million program to pave over 3,000 kilometers of roads by 1969 was being planned. Railroads were being dieselized; 50-pound rails were being replaced with 70-pound rails. Major construction went ahead on the Kaeng Khoi-Buayai (Khorat bypass) route. Electrification of Thai railroads was considered.

Multipurpose Bhumipol Dam at Yan Hee opened in May with two 70,000-kilowatt generators placed in operation; eventual capacity is set at 560,000 kilowatts. Demand for electric power was rising faster than anticipated so installation of a second pair of generators was planned, possibly as early as 1965. The Krabi lignite project, supplying power to tin mining, began operating. Reduction of electric power rates in the Bangkok area by an average of 8 percent on October 1 encouraged increased consumption; supplies were also becoming more dependable.

Nedago Engineering Authority (Netherlands) undertook a study sponsored by the United Nations Special Fund to determine means of improving Bangkok's cramped port facilities, and a study released by the National Economic Development Board favored port expansion at Sriracha, a possible $45 million project. The latter city has become an important crude oil importing center. Development of the port of Songkhla in southern Thailand was urged.

PRODUCTION

Production value of minerals in 1964 was estimated at $70 to $75 million, a sizable increase from that of 1963, owing mainly to an approximate increase of one-third in the value of tin. Production increases for cement, iron ore, antimony, lead-zinc, and fluorspar also were significant. Tin contributed nearly two-thirds and cement about one-fourth of the total value. Fluorspar, iron ore, and antimony were valued at more than $1 million each. Low-quality lignite was used primarily for generating electric power. Half of the salt and half of the manganese ore produced went to domestic markets. Tin output increased only slightly, although operations were in the process of expanding. Antimony and fluorspar increases were due in each case to production at one mine. Most of the iron ore was produced from one mine on the southern peninsula for export to Japan.

TABLE 1.—Thailand: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Antimony:					
Ore	---	61	87	1,357	2,819
Mine	---	33	44	622	1,400
Metal, plus 99 percent Sb	---	---	35	105	258
Iron and steel:					
Iron ore, 55 percent Fe ... thousand tons	11	56	45	16	[r] 191
Pig iron ... do	6	5	5	6	5
Steel ingots and castings ... do	7	8	7	[e] 7	4
Lead, mine	1,840	2,211	2,359	2,264	3,656
Manganese ore	528	533	2,898	[r] 6,520	11,054
Tin:					
Ore and concentrate ... long tons	16,493	18,096	19,997	21,276	21,288
Mine ... do	12,080	13,270	14,680	[r] 15,590	15,600
Tungsten concentrate (65 percent WO_3)	407	474	394	189	397
Zinc, mine (in lead-zinc ore)	1,060	900	950	850	1,380
Nonmetals:					
Cement ... thousand tons	526	797	963	996	1,043
Fluorspar, 80 to 85 percent CaF_2	3,460	4,755	10,710	29,230	63,538
Gypsum	14,080	12,040	21,000	23,890	41,900
Marl (used for cement) ... thousand tons	434	[e] 650	936	[e] 1,000	1,058
Salt, sea, 85 to 90 percent NaCl ... do	335	250	150	200	[e] 250
Mineral fuels:					
Coal, lignite ... thousand tons	149	108	135	137	104
Petroleum, crude [e] ... thousand 42-gallon barrels	40	50	50	45	45

[e] Estimate. [r] Revised.

TRADE [4]

Mineral exports valued at $50 to $55 million, comprising about three-fourths of Thai production, included virtually all of the tin, nearly all of the iron, antimony, tungsten, lead-zinc, and fluorspar ores, and about 10 percent of the cement produced. Over half of the tin concentrate continued to be exported to Penang in Malaya and most of the balance went to the Netherlands and Brazil. However, the export of tin concentrates was expected to drop by the second half of 1965 when domestic smelting was scheduled to begin. Oil trade was changing from product imports only to crude oil imports supplemented by small product imports as a result of the opening of a refinery capable of supplying most of Thailand's needs. Steel and fertilizers continued to be large import items. Nonmonetary gold was imported by Thai Gold Import Co., Ltd., under a 12-month monopoly license issued by the Ministry of Finance in April. Imports of 200,000 troy ounces of gold were contracted, and shipments began coming from the Stecosin Co. of Switzerland. Other gold, possibly drawn from Hong Kong was said to be entering the country illegally via the northern borders. Gold was sold openly in Thailand at about $40 an ounce.

---

[4] U.S. Department of Commerce, Bureau of International Commerce. Foreign Trade Regulations of Thailand. Overseas Business Reports OBR 64–54, June 1964, 8 pp., U.S. Department of Commerce. Thailand Imports, Foreign Investments Expected to Grow as Attractive Business Climate Spreads. Internat. Commerce, v. 71, No. 3, Jan. 18, 1965, p. 41.

TABLE 2.—Thailand: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1963 [e]
Metals:				
Antimony:				
Ore and concentrate	73	1,032	2,448	West Germany 340; France 190; Italy 185; Japan 100.
Metal	6	20	204	Undetermined.
Iron ore ... thousand tons	28	7	110	All to Japan.
Lead ore and concentrate	4,331	4,555	8,335	Belgium 2,750; France 700.
Manganese ore	301	2,760	[1] 6,735	Japan 1,800; Hong Kong 105.
Tin ore and concentrate ... long tons	[r] [2] 19,441	[r] 21,057	21,382	Malaya-Singapore 12,400; Netherlands 3,870; Brazil 2,580.
Tungsten ore and concentrate.	243	289	640	Japan 120; United Kingdom 85.
Nonmetals:				
Cement ... thousand tons	179	139	100	South Viet-Nam 100; Singapore 10.
Fluorspar	6,962	14,970	38,302	Japan 12,200; India 2,000; Taiwan 650.
Salt ... thousand tons	135	102	125	Malaya 25; Japan 24; Singapore 21.

[e] Estimate. [r] Revised.

[1] Metallurgical grade except for 2,512 metric tons of battery grade.

[2] Tin scrap and dross totaling 144 long tons was also exported in 1962.

TABLE 3.—Thailand: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys:			
Unwrought	1,189	1,651	United States 915; Canada 463; Taiwan 250.
Semimanufactures [e]	[r] 3,800	2,900	Japan 1,320; Hong Kong 500; Austria 220.
Copper and alloys:			
Unwrought	219	157	United States 120.
Semimanufactures [e]	[r] 1,840	2,200	Japan 1,760; United Kingdom 108.
Iron and steel:			
Pig and cast iron	303	300	All from West Germany.
Ferroalloys	612	617	Norway 371; Japan 139; France 101.
Semimanufactures. [e] ... thousand tons	277	313	Japan 228; Hong Kong 37; United States 21.
Lead:			
Unwrought	1,040	684	Burma 342; Hong Kong 220; Canada 55.
Semimanufactures [e]	70	130	Canada 51; Belgium 26.
Zinc and alloys:			
Unwrought	7,205	9,319	Australia 9,121; Hong Kong 99.
Semimanufactures [e]	1,793	1,621	Poland 925; United Kingdom 182; West Germany 148.
Nonmetals:			
Abrasives	658	634	Netherlands 463.
Andalusite, kyanite, and sillimanite	379	559	India 512.
Asbestos	5,391	8,021	Cyprus 3,003; Canada 2,929; Union of South Africa 2,051.
Cement	34,885	16,547	Taiwan 9,200; Japan 6,625.
Clay and kaolin	1,234	2,751	United States 1,826; India 508.
Fertilizers (chemical)	66,468	96,170	Japan 48,554; West Germany 19,602.
Graphite	460	494	Japan 382; Hong Kong 68.
Marble	352	153	All from Italy.
Sulfur	3,404	6,640	United States 2,540; France 1,845; Mexico 1,016.
Talc	1,393	854	South Korea 395; Japan 332.
Mineral fuels:			
Coke from coal	2,295	2,253	Japan 1,865.
Petroleum:			
Crude and partly refined ... thousand 42-gal. bls	----------	402	All from Saudi Arabia.
Refinery products:			
Gasoline ... do	[r] 3,404	3,423	Indonesia 2,790; Iran 415.
Kerosine and jet fuel ... do	[r] 2,041	1,822	Indonesia 1,370; Singapore 283; Iran 78; Japan 75.
Distillate fuel oil ... do	[r] 3,513	3,951	Indonesia 2,950; Iran 682.
Residual fuel oil ... do	[r] 2,320	2,637	Indonesia 1,365; Iran 1,105
Lubricants ... do	[r] 356	299	United States 130; United Kingdom 45.
Other ... do	[r] 400	371	Japan 132; Singapore 114; Iran 77.
Total ... do	[r] 12,034	12,503	Indonesia 8,480; Iran 3,060.

[e] Estimate. [r] Revised.

COMMODITY REVIEW

METALS

Aluminum.—Aluminum Company of Canada, Ltd., signed an agreement to supply technical assistance and aluminum ingots to a new $1 million Thai aluminum extrusion and anodizing plant. Production was scheduled for early 1965. A U.S. firm supplied the plant's machinery.

Antimony.—Antimony mining, stimulated by considerably higher world prices, increased in 1964, and output was expected to increase appreciably within the next few years. Most of the ores came from the Bansong mine of Siamerian Mining Enterprise Co., Ltd., operated under contract with Mining Products Co., Ltd. (Bangkok), in southern Thailand. Metallic antimony also was produced at the mine. Monthly production totaled about 200 tons of ore grading 45 percent or higher in antimony and 20 tons of metal smelted from other lower grade ores. A New York firm, M & T Chemicals, Inc. (formerly Metal and Thermit Corp.), showed interest and discussed possible purchase of Mining Products Co. shares. M & T would employ modern earthmovers and install more efficient smelter facilities. It was believed that antimony recovery could be improved from the present 50 percent to 80 percent or more of the ore content.

Iron Ore.—Output of iron ore was much higher owing to new operations started in May by Thailand Steel Co. at Tambol Nophitam, Nakhon Sithamarat Province, in southern Thailand. The deposit, near the Thai border, produced 176,125 metric tons of 59 to 63 percent iron ore, all exported to Japan. Reserves were estimated to total 800,000 tons of ore. Siam Cement Co., Ltd., continued open-pit operations at Huay Pong, Amphur Khok Sam Rong, Lopburi Province, producing ore for the small Tha Luang plant. Only 8,100 tons was mined, about two-thirds of the output in 1963. The mine of Eastern Mining Development Co. in Nakorn Sawan Province produced less than 7,000 tons of iron ore, which was apparently sold to the domestic market.

Krupp Exploration Co. (West Germany) continued a mineral survey centered on iron ore deposits in the northeast. Its contract with the National Energy Authority, due to expire at the end of 1964, was extended for another 16 months. The Krupp study was part of a feasibility survey to establish a major integrated steel center in Thailand.

Iron ore found in the Loey-Udorn area of northeastern Thailand during a United Nations Special Fund study of the Mekong Valley area was reported to have potential but needed further exploration. British geochemists were conducting studies of the iron mineralization as well as of the lead and zinc mineralization also present in the deposits. Estimates for iron ore have been variously reported as large as 16 million tons, but ore bodies are scattered and explorations have not confirmed such a tonnage.

Iron and Steel.—Efforts were renewed to establish a Thai-owned integrated iron and steel complex utilizing domestic ores, particularly the iron ore deposits in Loey Province. The United States, West Germany, Japan, and most recently Austria have shown interest in the project. The West German company, Krupp, continued its technical and feasibility surveys for the project. Koppers International C. A. (United States) also studied feasibility of a Thai steel plant. The small charcoal-burning blast-furnace operation at Tha Luang north of Bangkok continued producing a small amount of pig iron, and scrap was smelted in the Bangkok area.

Thai Steel Sheet Manufacturing, Ltd., a new company four-fifths owned by a combine of four Japanese firms, planned an $11 million reversing mill in Bangkok. The plant, with capacity of 10,000 tons of steel sheets monthly, was scheduled for completion in mid-1966. Nippon Kokan K. K. (Japan Steel & Tube Corp.), one of Thailand's largest steel suppliers, considered establishing a Thai branch. Far East Iron Works Co., Ltd., started operating its third galvanized sheet plant at Amphur Pakchong, Khorat Province, northeast Thailand. Capacity was estimated at 1,500 sheets per month. The company's total capacity for galvanized sheet was said to exceed Thai consumption, but demand was reportedly increasing by 10 percent annually. Thai Steel Pipe Industry Corp., a joint venture of Sumitomo Metal Industries, Ltd., and Nomura Trading Co., Ltd., scheduled completion of a 16,000-ton seamless steel pipe plant at Bangkok by April 1965. Capacity, slightly less than the estimated Thai demand of 18,000 tons annually, was to gradually be expanded to 30,000 tons within several years. G. S. Steel Co., Ltd., a Thai-Japanese firm, was building a $1 million steel foundry that, upon completion in 1966, would produce up to 72,000 tons of iron and steel bars annually from scrap iron.

The domestic tinplate industry wanted an increase in import duties on tinplate from 0.75 to 2.00 baht per kilogram ($36 to $96 per metric ton), but the Government retained the lower rate.

Lead and Zinc.—The potentially rich Mae-Sot smithsonite-calamine zinc deposit on the Thai-Burmese border remained undeveloped, because the area lacked transportation. Mining permits were held by a Japanese concern. Most of the country's few thousand tons of lead-zinc ore production in 1964 came from the Nong Phai (Nong Bhai) mine, Kanchanaburi Province. Exports totaled 8,335 metric tons of ore. Exported ores contained 35 to 45 percent lead, 10 to 17 percent zinc, and 4 to 5 ounces of silver per ton.

Manganese.—Production in 1964 included 5,160 tons of battery-grade ore, 5,700 tons of metallurgical-grade ore, and about 200 tons of chemical-grade ore. About half of the battery-grade ore and two-thirds of the metallurgical-grade ore was exported. The producing mines, situated in northern Thailand and on a small island off the west coast of the Gulf of Thailand, were open-cast operations with hand sorting and washing. At least two other promising deposits were being studied, one in northern Thailand and one in the northeastern part of the Khorat Plateau. Overall reserves have been estimated at 7 million tons of ore. A manganese deposit reportedly containing 250,000 tons of ore was under development in the Kumoon area. U.S. interests were looking into possible participation in Thai manganese mining. One firm previously had been purchasing Philippine ores.

Tin and Tungsten.—Tin output was only a few tons more than in 1963; exports increased more than 300 tons and brought an increase of about $13 million in foreign exchange. This increase in exports was due to higher world prices. The estimated $46.8 million realized from production of tin in 1964 was a one-third gain in income. Concentrates were exported mainly to Penang in Malaya and to the Netherlands. Metal content of exports totaled 15,666 long tons, with Malaya receiving 8,863 tons, the Netherlands 4,822 tons, and Brazil, Spain, Japan, and the United Kingdom the remainder. Yearend stocks at mines and in transit were estimated at 950 tons.

Tin was mined in two main areas, along the west coast of Thailand's peninsular section and west of Bangkok near the Thai-Burmese border. Two-thirds of the production was from the southern provinces of Phuket, Takuapa, Phangnga, and Ranong; the remainder was produced in the northern tin districts.

Dredge production of tin declined 5 percent in 1964, but gravel pump and hydraulic operations recorded a 7-percent increase. Only 36 percent of the concentrate recovered was obtained by dredging while 45 percent came from gravel pump and hydraulic mining; dulong washing produced less than 5 percent of the total. The relative increase in gravel pump production reflected the inherent flexibility of this type of operation that requires limited capital investment and that can be quickly started when prices are favorable. Operating dredges, totaling 24, compared with 23 in 1963, were situated at 20 locations as in 1963. The 158 gravel pump and hydraulic mines exceeded the 1963 total by 27. A rebuilt seagoing bucket dredge, belonging to Aokam Tin, Ltd., completed trials in May and began to work offshore deposits between the mainland and Phuket Island.[5] The Siamese Tin Syndicate dredge at Katu was being dismantled for transfer to Ngow in Tanong. Operation at Ngow was expected to start in 1965 and would involve redredging old tailings over an anticipated 14-year span.

Thai Smelting & Refining Co., Ltd. (Thaisarco), jointly held by Union Carbide Corp. (United States) and the Thai firm, Eastern Mining Development Co., Ltd., began building Thailand's first large tin smelter at Phuket in southern Thailand in November 1964. The $7 million plant, scheduled to open in July or August 1965, will be able to handle 20,000 long tons of concentrates yearly and produce 40 tons of 99.5-percent pure tin daily. Consequently, the Thai Government banned long-term tin contracts for foreign concentrate sales and set July 23, 1965, as the termination date for exports. Monopoly conditions under which the smelter was to operate caused concern among tin producers. Under a 1963 agreement Thaisarco also held extensive 5-year concessions for offshore prospecting of coastal regions. Union Carbide Corp. planned tin explorations in the Andaman Sea when seasonal weather permits.

Tungsten, an important byproduct of tin mining, more than doubled in both production and exports, and value nearly quadrupled to almost $500,000. The Pilok tin-tungsten district near the Thai-Burmese border was a leading source. Low tungsten prices had forced the closing of a number of marginal mines in southern Thailand, but some of these were resuming production.

---

[5] Tin International. Helping in the Present Tin Supply Squeeze-Rising Tin Production in Thailand. July 1964, pp. 171–175.

NONMETALS

Cement.—Production was 5 percent more than in 1963. Domestic sales were reported at 869,416 metric tons, about 83 percent of the total production, and were valued at $19.5 million. Exports were curtailed briefly when it appeared that a domestic shortage was imminent, but during the year 100,000 tons of cement was exported, chiefly to South Viet-Nam. The main producer and only exporter was Siam Cement Co., Ltd., with plants at Tha Luang and Bangkok; its 1964 output was 865,840 tons. Cholprathen Cement Co. was the only other producer. Thai cement demand was expected to rise sharply in 1965, owing to high rates of construction activity. The Tungsong cement plant of Siam Cement Co., under construction in southern Thailand, was scheduled to begin operating about year end with an initial capacity of 300,000 tons per year. Electricity provided by the new Krabi lignite thermal power development will be used by the plant.[6]

Clays.—Ceramic tile, previously imported in substantial quantity, will be manufactured from domestic clays in a $0.5 million Japanese-equipped plant scheduled for operation about yearend. Three regions of Thailand will provide clays for blending to achieve the desired products. Future import restrictions on tiles were foreseen.

Fluorspar.—Some consideration was given to establishing a fluorspar flotation plant in a suitable location, possibly the Ban Phu Krood (Khao Chom Thai) district of Rat Buri Province, where Siam Ore Co., Ltd., was active. Fluorspar output was more than double that of 1963 and exports increased to 38,302 metric tons; shipments were mainly to Japan. Apparently, Ban Phu Krood operations were responsible for most of the increases, and further expansions were foreseen.

Marble.—At least two marble quarries have been in operation for 3 to 4 years producing several hundred tons annually. Italian marble-working machinery is used. Location of the quarries and quality of product are undetermined.

MINERAL FUELS

Lignite.—Mining began in June at Khlong Khanan, Krabi Province, southern Thailand, to supply lignite to the 40,000-kilowatt powerplant at Krabi, which started operation about mid-year. Approximately two-thirds of the power generated was expected to be used for tin mining and one-third by nearby cities. Coal consumption was expected to rise to 600 tons daily at capacity operation. By yearend only 13,400 tons had been mined. Deposits were divided into three areas. The largest area was estimated to contain 3.5 million tons of reserves, the others 1 million tons each.

Mae Moh deposits near Lampang, north of Bangkok, continued to provide the bulk of Thai coal. Mine output was used mostly by the 12,500-kilowatt thermal plant of Thai Lignite Authority at Mae Moh. Coal demand and power sales declined after the major construction was completed at the Yan Hee damsite. Small tonnages of coal were sold to purchasers other than the powerplant. Estimates showed 45 million tons proven and 120 million tons of probable coal reserves. Production costs were $2.16 per ton of coal mined.

---

[6] Freyn, Hubert. Cement at Tungsong. Far Eastern Econ. Rev., v. 45, No. 10, Sept. 3, 1964, pp. 448–449.

A U.S. company, Eastern Gas and Fuel Associates, expressed interest in blending imported U.S. bituminous coking coals with Thai lignite for use in proposed steel manufacture. Annual sales of several hundred thousand tons of coking coals were envisioned. Use of Sarawak coal in the blend was under consideration. Samples of Thai coal were undergoing tests at the laboratories of a subsidiary firm in Everett, Mass.

Construction started in May on a Government-financed lignite-based fertilizer plant at Mae Moh, using German-supplied equipment and the Stamicarbon process. The plant was to start operation by late 1966 with a planned capacity of 60,000 tons of ammonium sulfate and 30,000 tons of urea and will operate under the Lignite Authority through Chemical Fertilizer Co., Ltd.

Petroleum.—Except for a few hundred barrels of oil per day produced from the small Farng Basin field in northern Thailand and processed at Farng, the country's oil product requirements have been met by imports, largely from Indonesia and Iran. However, the trade pattern changed radically in 1964 when Thai Oil Refining Co., Ltd., began operation of its 36,000-barrel-per-day refinery at Sriracha.[7] The new plant received its first shipment of crude oil in April and began operating in September. With it, the existing Farng plant and the opening of a small Government-owned refinery at Bangchak, Thailand had become virtually self-sufficient in oil products, depending only on imported crude oil. The change meant an annual savings of about $10 million in foreign exchange.

The Sriracha refinery, one of Thailand's largest single investment projects, began partial operation several weeks ahead of schedule. However, the 5,000-barrel-per-day Bangchak refinery of the Defense Energy Department was still incomplete in late 1964, although test runs were reported. Following unsuccessful attempts to lease-operate the Bangchak refinery, it was offered for rental. Summit Industrial Corp. of Panama was finally awarded an operating contract with provision that refining capacity would be expanded from 5,000 to a more economic 15,000 barrels per day.

Thai Asphalt Manufacturing Plant Co. operated a 3,000-barrel-per-day refinery near Sriracha using Saudi Arabian crude or partly refined oils. Thai Petroleum Transport Co. planned to shuttle four 2,000-ton tankers between Sriracha and Bangkok. A new excise tax was placed on domestically refined petroleum products to replace former taxes on imports, and formal action was taken to remove the duty on crude oil imports. The retail price of regular gasoline in Bangkok at about yearend was 34.4 cents per U.S. gallon, including 14.5 cents duty and 5.82 percent taxes. California Texas Oil Corp. was reported to be investigating another possible Thai oil refinery and the risk guarantees by the Investment Guaranties Division of the U.S. Agency for International Development.

Prospecting in the Farng basin resulted in five new producing wells, but flows were small and of a different type (high-wax) than that processed at the local refinery. Funds for altering the small Farng refinery to meet the changed requirements were denied by the Thai cabinet until sufficient oil of this type is found.

---

[7] Davies, Derek. Refining With Thais. Far Eastern Econ. Rev., v. 47, No. 1, Jan. 7, 1965, pp. 21–23.

The Economic Commission for Asia and the Far East (ECAFE) was considering geophysical surveys of Thailand's offshore areas. Applications by Standard Oil Co. of New Jersey and Shell Oil Co. for oil leases in the Gulf of Thailand shelf areas were under review but could be delayed pending developments from the ECAFE project, if carried out. A 5-year oil prospecting contract, covering a 2,880 square mile area in Ubol and Nakorn Panam Provinces in the northwest, was awarded Raphael Pumpelly (Pacific Palisades, California) at a royalty of $2,000 per year. Arthur J. Rief (Bangkok) made application to explore a 2,600 square mile area of the Khorat Plateau. Results of the oil survey by Union Oil Co. of California, in progress for several years, were undisclosed, but the company was trying to arrange with the Government for more favorable exploitation agreements before making extensive geophysical surveys. Other applicants for concessions included Gas & Mine Co., Ltd. (Bangkok), and Paul Ballair (Los Angeles, California).

The Mineral Industry of Other Far East Areas

By Benjamin H. Lim[1] and K. P. Wang[2]

Contents

Page
Cambodia 1279
Hong Kong 1282
Laos 1285
North Viet-Nam 1288
South Viet-Nam 1292

CAMBODIA[3]

CAMBODIA had very little mining activity in 1964, and industrial activity was based principally on the processing of agricultural and forestry products. Although there has been active mineral exploration in this country of about 6 million during the last few years with technical assistance provided by France, mainland China, and others, this effort yielded little, if any, significant success. The once relatively rich gold mine at Phnom Long in Lompong Thom Province that used to employ about 1,000 workers was rapidly approaching exhaustion as were a few other smaller properties. Mining activity was chiefly confined to extracting and processing small quantities of phosphates, limestone, semisprecious stones, and salt.

Industrial development, especially of primary and secondary industries, continued to be hampered by a number of factors including lack of essential raw materials, inadequate number of skilled managerial and technical personnel, and insufficient indigenous fuel supply. Electric power output fell short of demand in 1964. Cambodia's industrial development also was impeded considerably by the unstable financial structure in the country's economy. During the last quarter of 1963, the Cambodian economy was seriously damaged when one of the country's two leading private commercial banks, the Bank of Phnom Penh, became insolvent. Major consequences of the bankruptcy were an unofficial devaluation of the riel from 35 to over 90 riels to $1, nationalization of international trade and banking activities in early 1964, and the implementation of other drastic government measures in an effort to stem the tide of a rapidly deteriorating economy. Concomitant with the worsening financial situation, which harassed the Cambodian economy throughout 1964, was the additional strain of continued heavy inflationary pressures that precipitated a high rate of unemployment.

---

[1] Physical scientist, Division of International Activities.
[2] Chief specialist, East Europe-Far East, Division of International Activities.
[3] Prepared by Benjamin H. Lim.

GOVERNMENT POLICIES AND PROGRAMS

The first 5-year plan, adopted on January 1, 1960, and to end on December 31, 1964, provided for surveys of mineral resources and development of light industries. On the whole implementation of this plan was successful. During the plan's period, Cambodia's gross national product (GNP) rose from $545 million in 1960 to $705 million in 1963 with respect to current prices. The Cambodian Government was in the process of drawing up a second 5-year plan which will include three major industrialization projects for 1965. Two of the projects are a petroleum refinery and a steel rolling mill capable of producing 13,000 tons of iron and steel products annually. A third project calls for a comprehensive development of the Mekong River in the Saur Vaur area. This project was to include construction of a dam approximately 120 feet high. An accompanying powerhouse is to be designed to generate 600,000 kilowatts initially, and output was to be expandable to 1.2 million kilowatts when a second reservoir is constructed in the upper reaches of the river.[4]

PRODUCTION

Despite near exhaustion of the gold mines, production of gold was probably about the same as in 1963. Production of salt, by evaporation of marine water, was more than sufficient for local use. Phosphate rock, mainly for local use as fertilizers, came primarily from Battambang and Kampot provinces. Small amounts of zircon, sapphire, and ruby were obtained from Battambang and Strung Treng provinces. Basalt, red brick clay, and sand were found in Kampong Cham and Kampong Seu provinces. In addition, minor deposits of coal, lead, copper, tin, molybdenum, and antimony have been discovered in several areas in Cambodia.[5]

TABLE 1.—Cambodia: Production of metals and minerals

Commodity	1960	1961	1962	1963	1964 [e]
Metals:					
Gold troy ounces	4,180	4,180	965	6,687	7,000
Nonmetals:					
Cement thousand metric tons					10
Salt do	37	54	54	60	60
Phosphate rock do	NA	NA	150	150	150

[e] Estimate. NA Not available.

TRADE

Cambodia's mineral exports remained insignificant; the country's chief exports being rice and other agricultural products. Its principal mineral imports continued to be petroleum products, cement, and iron and steel semimanufactured goods used for construction purposes. The quantities imported reflect the consumption of these commodities for any given period. In monetary terms, Cambodia's total foreign trade is approximately three-fourths with free-world countries and the remainder with Communist countries, chiefly mainland China, Czechoslovakia, Poland, and the U.S.S.R.

---

[4] Japan Trade Bulletin. Comprehensive Development on Mekong River Under Japanese Plan Likely. No. 434, Nov. 21, 1964, p. 1.

[5] Cheplo, N. J. Basic Data on the Economy of Cambodia Overseas Business Reports. U.S. Department of Commerce, OBR 65–19 March, 1965, 12 pp.

On March 1, 1964, Cambodia nationalized its foreign trade and brought it under a newly created agency, Société Nationale d'Exportation et d'Importation (SONEXIM). The country instituted the measure in hopes of creating a more favorable balance of trade.[6]

TABLE 2.—Cambodia: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:[1]			
Unwrought	57,386	47,409	Mainly from Japan.
Semimanufactures	10,136	11,157	
Nonmetals:			
Cement	169,779	189,392	All or most from Communist countries.
Other (mainly talc)	154	259	Mainland China.
Mineral fuels:			
Petroleum:			
Crude ... thousand 42-gallon barrels	148	164	Mainly from Indonesia.
Refinery products:			
Gasoline ... do	570	607	
Distillate fuel oil ... do	468	608	
Residual fuel oil ... do	65	53	
Lubricating oil ... do	39	51	
Solvent ... do	1	2	
Grease	567	337	
Asphalt	3,403	974	
Paraffin	880	761	

[1] Largely iron and steel.

Source: Banque Nationale du Cambodge. Bulletin Mensuel. 1963 and 1964.

COMMODITY REVIEW

Metals.—Although there is some high-grade iron ore in Kompong Thom Province suitable for opencast mining, the lack of domestic mineral fuel, capital, skilled labor, and transportation facilities precludes the development of these ores. Geological survey teams from various countries have made a number of investigations of other mineral occurrences, but reports on these investigations have indicated little if any commercial potential.

Nonmetals.—*Cement and Lime.*—The cement plant at Chakrey Ting, built with technical assistance from mainland China, was officially opened on September 9, 1964, by the Chief of State. The plant has an annual capacity of 50,000 tons. Part of the materials, iron oxide, gypsum, and coal, will be imported from mainland China. During late 1964, the Chief of State announced that the Communist Chinese Government had offered to double the plant's capacity.

Silicia.—The Communist Chinese Government offered to build a glass factory in Cambodia. Toward this end, a group of geologists from mainland China went to Cambodia to survey conditions at Strung Meanchey in Kandal Province, where the proposed glass factory was to be constructed. In July 1964, 10 mainland China technicians arrived in Cambodia to conduct a 2-month technical study of sand supplies and other problems related to the glass factory.

---

[6] Cheplo, N. J. Foreign Trade Regulations of Cambodia Overseas Business Reports. U.S. Department of Commerce, OBR 65–2, January, 1965, 8 pp.

Mineral Fuels.—In the latter part of 1964, an agreement was signed between the Cambodian Government and two French firms to construct a refinery at Sihanoukville with an annual capacity of 50,000 tons of petroleum. The approximate cost of the refinery was set at about $10 million. The Société Khmere de Raffinage, the managing company, will have the majority interest, while the French State-controlled companies, Régie Autonome des Pétroles and Union Générale des Pétroles, will have a minority share and will provide technical and financial assistance.[7]

HONG KONG[8]

Except for iron ore mined at Ma On Shan, the mineral output of Hong Kong in 1964 was relatively insignificant, even on a domestic basis. Total value of crude mineral output for the year was slightly over $1 million, of which $900,000 was for iron ore. Because Hong Kong had no facilities to process the ore, it was exported to Japan. Although the colony imported about 381,000 tons of iron and steel in 1964, chiefly for construction purposes, a large part of its steel and iron requirement was domestically supplied by scrap from salvaged ships. Heavy industrial development in Hong Kong has not kept up with that of light industries, especially that of textile manufacturing, because the limited size of the domestic market has not justified expansion. Moreover, high local production costs would tend to prevent heavy industrial products from being competitive in the world market.

GOVERNMENT POLICIES AND PROGRAMS

The Mining Ordinance of 1954 placed the ownership and control of minerals in Hong Kong and the New Territories with the Crown of United Kingdom. Several accident prevention provisions were added to the ordinance in 1964. Under Hong Kong mining regulations, the Commissioner of Mines issues prospecting and mining licenses, the land officer grants mining leases, and the Superintendent of Mines issues mine blasting certificates in addition to examining export licenses for minerals mined locally. The Superintendent also assesses royalties on mineral sales, at a rate of 5 percent of value. At yearend 1964, 3 mining leases, 15 mining licenses, and 2 prospecting licenses were valid in the colony.

The Hong Kong land development commission has chosen two sites, Kwun Tong and Tsuen Wan, for industrial use. When these projects are completed, they will provide a total of 1,628 acres for industrial employment.

---

[7] Nivolon, F. Khmere Refinery. Far Eastern Economic Review. V. 46, No. 111, Dec. 10, 1964, p. 543.

[8] Prepared by Benjamin H. Lim.

PRODUCTION

Mineral production in Hong Kong was less in 1964 than in 1963. Wolframite output continued its downward trend because of the low world market price. Cement output declined slightly and in 1964 was valued at $3.2 million compared with $3.5 million in 1963. Coke and breeze production in 1964, valued at $254,000, was also slightly below the 1963 level. Of approximately half a dozen minerals mined in Hong Kong, iron ore was the only one of economic importance, accounting in 1964 for nearly 90 percent of the total value of mineral production of about $1 million.

TABLE 3.—Hong Kong: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Iron ore concentrate……thousand tons..	117	119	113	114	116
Wolframite……60 percent WO$_3$ basis..	35	18	16	8	1
Nonmetals:					
Cement……thousand tons..	150	184	212	217	215
Feldspar	2,551	1,225	952	1,710	1,581
Graphite	3,860	1,692	818	808	721
Kaolin	6,770	8,565	6,470	5,099	5,124
Quartz	3,870	4,110	4,220	3,040	1,649
Mineral fuels:					
Coke and breeze [1]……thousand tons..	18	[e] 17	17	15	13

[e] Estimate.

[1] Between ½ and ¾ consumed by the producer in making town gas.

TRADE

Hong Kong, as an international entrepôt, imported in 1964 chiefly from mainland China, Japan, the United States, and the United Kingdom in respective amounts of $345, $271, $172, and $146 million out of a total of $1,297 million worth of all goods. Exports for the year

TABLE 4.—Hong Kong: Exports and reexports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destination, 1964
Metals:				
Aluminum and aluminum products	1,782	1,692	2,803	South Viet-Nam 1,179; Ceylon 711.
Iron and steel:				
Iron ore……thousand tons..	117	122	132	All to Japan.
Semimanufactured products……do....	43	57	56	Thailand 41; Philippines 6.
Scrap, iron and steel……do....	110	138	151	Japan 98.
Nonmetals:				
Cement:				
Exports……do....	36	15	8	Oceania 5.
Reexports……do....	7	16	16	Sabah 4; Macao 4; India 3; Brunei 1.
Feldspar and fluorspar	406	650	597	Philippines 415.
Graphite:				
Exports	469	102	467	United States 305.
Reexports	1,180	73	394	India 200; Thailand 123.
Kaolin	4,730	4,190	2,947	Japan 2,309; Taiwan 638.
Mineral fuels (reexports):				
Petroleum refinery products:				
Fuel oils……thousand tons..	17	20	26	Macao 25.
Other….thousand 42-gallon barrels..	67	86	109	Macao 49.

totaled $775 million, with the United States and the United Kingdom together receiving about one-half of the total. Total reexport in 1964 was valued at $237 million, slightly above the 1963 level. Southeast Asian countries and Japan received most of the reexports. In 1963, nearly all the fertilizer it imported was reexported to mainland China. In 1964, however, hardly any fertilizer was reexported; thus, a subsequent significant reduction in the imports of this commodity.

Of the total 1964 import value, metals accounted for approximately $102 million and nonmetals for $71 million. In 1963 these commodities were valued at $78 million and $87 million, respectively. Imports of mineral fuels, chiefly coal and petroleum products, totaled $46 million in 1964, about the same value as in 1963. Hong Kong's metal and mineral exports, chiefly household ware, iron and steel bars, and scrap, were valued at about $18 million in 1964, $1 million below the 1963 level. In addition, all of Hong Kong's iron ore production, valued at about $1 million in 1964, was shipped to Japan.

TABLE 5.—Hong Kong: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964
Metals:				
Aluminum and aluminum products	8,720	9,790	15,910	Canada 8,469; Australia 2,082.
Copper and copper alloys	7,588	8,699	12,708	Japan 6,142; United Kingdom 1,949.
Gold ..... thousand troy ounces	969	1,179	NA	
Iron and steel:				
Iron ore	8,390	12,450	1,570	All from mainland China.
Scrap, iron, and steel ..... thousand tons	43	42	60	United Kingdom 34; West Germany 15.
Pig iron (sponge)	5,920	9,730	7,578	Mainland China 5,988.
Ferroalloys	56	121	84	Rep. of South Africa 25; Mozambique 25.
Semimanufactures ..... thousand tons	317	411	373	Japan 174; mainland China 101; United Kingdom 39.
Ingots and equivalent forms	4,720	3,040	818	United Kingdom 464; Japan 232.
Platinum (unworked) ..... troy ounces	11,275	22,426	24,382	West Germany 18,908.
Silver (unworked) ..... do	26,000	86,333	106,596	North Korea 96,398.
Zinc:				
Scrap	37	77	265	Malaya and Singapore 95; Sweden 65.
Ingots and equivalent forms	4,570	4,520	8,310	Australia 3,680; North Korea 3,271.
Semimanufactures	553	531	538	Belgium 129; Poland 79.
Nonmetals:				
Cement ..... thousand tons	585	831	1,809	Mainland China 490; Japan 283; Taiwan 190.
Fertilizers ..... do	48	132	7	West Germany 4; Thailand 1.
Lime ..... do	45	59	63	Mainland China 47.
Salt ..... do	39	35	33	Mainland China 26.
Mineral fuels:				
Coal ..... thousand tons	219	193	175	Mainland China 130.
Coke	4,080	4,100	6,321	Taiwan 3,460.
Petroleum refinery products:				
Fuel oils ..... thousand tons	1,251	1,576	1,515	NA.
Other thousand 42-gallon barrels	2,452	2,942	3,898	Singapore 1,176; Iran 434.

NA Not available.

COMMODITY REVIEW

Metals.—*Aluminum.*—Until 1963, Hong Kong's aluminum industry was composed mainly of small re-rollers and utensil manufacturers. An aluminum extrusion plant, owned by The Hong Kong Chiap Hua Manufacturing Co., Ltd., started extrusion operations in the latter part of 1963. The annual capacity of the mill was 2,000 to 2,500 tons of rod, tube, and sections, sufficient to meet the bulk of local demand.

There were plans to increase the capacity to 5,000 tons annually to meet expected foreign demands.[9]

Iron Ore.—All the iron ore production came chiefly from underground operations at Ma On Shan on the mainland of the New Territories, 2.8 kilometers from the coast. The mine, operated by the Mutual Mining and Trading Co., on behalf of the lessee, the New Territories Mining Co., Ltd., is in a magnetite ore body that averages 32 percent iron. In 1964, about 256,000 tons of crude ore was supplied to a dressing plant with a daily capacity of 850 tons. Concentrate produced by wet magnetic separation in 1964 totaled 114,000 tons, averaging 56 percent iron, all destined for Japan. In 1964, approximately 118,000 tons was exported, indicating a decrease in stocks.

Iron and Steel.—Shun Fung Ironworks placed an order with the Distington Engineering Co., a subsidiary of The United Steel Companies, Ltd., to build a continuous casting plant. The mill was expected to be installed in the area of Junk Bay early in 1965 and to be operating by July of that year. The continuous casting mill was expected to operate at costs competitive with those of mainland China and Japan.[10] Hong Kong Sakai Steel Pipe was established jointly with local and Japanese capital to produce large diameter pipes. Operations started in December 1964. Initially, the company will produce 500 tons of 20-inch-diameter pipes per month. The plates for the pipes will be imported from Japan.[11]

LAOS [12]

Laos, with an area approximately equal to that of Colorado and a population of 2.5 million, remained an insignificant producer and consumer of minerals in 1964. Tin continued to be the most valuable mineral resource, but output has been equivalent to only about one-half of 1 percent of Laos' yearly GNP. It is exported mainly to Malaysia in concentrate form with a 50-percent in content.

The country's foreign trade remained very limited. Because of its landlocked position, practically all its foreign trade moved through Thailand. As there are no railroads in Laos, transportation is limited to airplanes, riverboats, and trucks. The continued, unsettled political and economic conditions in Laos were unfavorable to the development of a mineral industry. Moreover, Laos lacks the necessary skilled labor force to implement even a gradual transition from a practically all agrarian society to one having a small industrial sector.

GOVERNMENT POLICIES AND PROGRAMS

Laos had a 5-year development program extending from July 1959 to June 1964. Some of the goals of the program were to undertake mineral exploration, to develop certain specific industries, and to construct transportation and communication facilities. Under the plan, the Laotian Government encouraged industrial development by exempting industrial machinery from import tax and by allowing a 10-year exemption from income tax for new industrial ventures. The plan was abandoned after its first year on account of rapidly deteriorating political and security conditions and was not resumed.[13]

---

[9] Metal Bulletin (London). New Hong Kong Extruder Expanding. No. 4952, Dec. 1, 1964, p. 21.

[10] Chang, Henry S. Continuous Steel. Far Eastern Economic Review. V. 46, No. 3, Oct. 15, 1964, p. 154.

[11] Metal Bulletin (London). Japanese Plant in Hong Kong. No. 4952, Dec. 1, 1964, p. 18.

[12] Prepared by Benjamin H. Lim.

PRODUCTION

Tin was the only mineral product of Laos for which production statistics are available. Output of concentrates and their approximate tin content have been as follows:

Year	Concentrates (long tons)	Metal content (long tons)
1960	765	383
1961	667	335
1962	709	367
1963	650	326
1964	686	343

Mineral commodities produced in small quantities for local consumption but for which no output statistics are available include copper, iron, clays, gravel, sand, coal, and petroleum from seeps.

TRADE

The principal mineral export of Laos has been tin concentrate. Exports of this commodity have accounted for about 65 percent of the total value of exports. Unsettled conditions have resulted in sharply reduced production and export of tin.

Laos imported practically all of its mineral requirements in manufactured form, chief among which were refined petroleum products that accounted for more than one-half of the total value of imports. Other major categories of imports included iron and steel products and cement. Lack of even small processing facilities necessitated imports of metal products mainly in their final forms. In 1963, imports of metal and metal products amounted to $2.7 million, approximately 9 percent of the total value of imports. Imports from the United States amounted to only about $0.4 million. Asian countries, notably, Indonesia, Thailand, and Japan, supplied about $21 million worth, or 70 percent of the total.

COMMODITY REVIEW

Metals.—*Iron Ore.*—Recent surveys indicated iron-ore deposits of approximately several billion tons in Xieng Khouang Province. The ore, reported to have an average iron content of about 70 percent, could be mined profitably by open-cut methods when financial, political, and technical conditions permit.

Tin.—In 1964, as in the past, Laos' most valuable mineral product was tin ore, mined at Phontieu in Khammoune Province. The 1964 production was slightly more than that produced in the previous year.

---

[13] Cheplo, N. J. Basic Data on the Economy of Laos. U.S. Department of Commerce. Overseas Business Reports, OBR 64–105. September 1964, 12 pp.

TABLE 6.—Laos: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum	78	83	Japan 32; United States 28; Thailand 14.
Copper	55	57	Thailand 45; Japan 8; United States 2.
Iron and steel	3,700	8,106	Thailand 3,522; Japan 3,125; United States 849.
Lead	38	9	Thailand 8; United States 1.
Zinc	NA	15	Thailand 15.
Nonmetals:			
Calcium carbide	NA	113	Taiwan 100; Japan 13.
Cement	34,811	31,324	Thailand 30,691; Israel 405; Japan 171.
Salt	15,259	[e]15,000	All from Thailand.
Mineral fuels:			
Petroleum refinery products:			
Aviation gasoline thousand 42-gallon barrels	155	138	Indonesia 64; United States 56; Singapore 18.
Motor gasoline do	130	155	Indonesia 86; Singapore 42; United States 27.
Kerosine do	20	39	Indonesia 15; Singapore 12; United States 12.
Distillate fuel oil do	36	59	Indonesia 30; Singapore 16; United States 13.
Residual fuel oil do	16	19	Singapore 13; Indonesia 6.
Lubricants do	7	13	United States 8; United Kingdom 4.
Other do	5	1	Mainly from United States.
Paraffin wax	NA	712	Indonesia 414; United States 203.
Asphalt	206	1,981	United States 1,584; Singapore 287; Indonesia 110.

[e] Estimate. NA Not available.

Source: Royaume du Laos. Bulletin du Commerce Extérieur (Bulletin of Foreign Commerce) 1963.

About 500 tons of ore are required to produce 1 ton of 50 percent tin concentrate. The concentrate was transported by road to Udorn, Thailand, and from there reshipped via rail to Penang or Singapore for smelting. The proven reserve of tin ore was estimated to be about 70,000 tons of metal content. Presumably, Laos could produce about 3,000 tons of tin a year. However, existing finances, equipment, and personnel are inadequate for expansion of existing tin production and for overall exploration program of tin deposits.

Other.—Recent surveys have indicated deposits of gold, copper, manganese, lead, and zinc in various areas of Laos. The development of these deposits has been hampered by the lack of transportation facilities and by the general instability of the existing politico-military situation in the country. Large capital investments will be needed before Laos' mineral resources can be adequately assayed and exploited.

Nonmetals.—*Cement.*—The cement plant at Thakhet with a proposed capacity of 25,000 tons annually has been under construction intermittently since 1954. Completion date was scheduled for late 1963, but through early 1965 there has been no indication that the plant has been in operation.

Salt.—Salt deposits in various parts of Laos have been exploited by primitive methods and on a small scale to satisfy local needs, but trade figures show that output must be supplemented by imports to meet requirements.

Mineral Fuels.—Exploitable deposits of coal, petroleum, and natural gas have been discovered by recent geological surveys, but development of these resources would require heavy financial outlays to construct transportation facilities, purchase equipment, and develop the necessary skilled labor. These factors of production and others were not available in Laos in 1964.

NORTH VIET-NAM [14]

North Viet-Nam's mineral output generally increased in 1964. Appreciable mineral resources and continued emphasis on development of basic industries and mineral resources under the 1961–65 5-year plan has brought about a transformation of the economy of this area of 16 million people. By 1964 the role of industry was on a par with that of agriculture, and industrial output value showed a growth of 10.7 percent over that of 1963. The mineral industry's contribution to total industrial output is hard to assess; however, North Viet-Nam's 1964 mineral output value of approximately $100 million was considerably more than that of Thailand and Burma.

Despite the growth of the mineral industry, only a few products were significant by international standards. North Viet-Nam's high quality anthracite continued to be in demand in oriental markets. Production of phosphate ores in 1964 was about 2 percent of the world total. The third product of some consequence during the year was high-grade metallurgical chromite, perhaps 1 percent of the world supply.

The country's ability to supply its own mineral requirements as well as to meet foreign demands was further improved. Enough iron ore was uncovered to meet the needs of a second medium-sized center. The nonferrous metal picture has brightened as new deposits have been discovered and developed. The chemical and fertilizer resource base had already been proven to be good, and most other nonmetallic raw materials appear adequate to meet most foreseeable demand. Although anthracite was abundant and the hydropower potential considerable, no petroleum, and only a small amount of coking coal have been found. North Viet-Nam produced about 520 million kilowatt-hours of electricity in 1964. The most important mineral development during 1964 occurred in iron and steel. A second blast furnace was commissioned at the Thai Nguyen integrated steelworks built with mainland China aid, and construction was underway on a third blast furnace. Apatite mine output capacity was expanded in 1964 to above 1 million tons per year, primarily to supply foreign markets. A part of addition cement facilities at Haiphong, built with Rumanian help, started production. The expansion program of the Hon Gay-Cam Pha (Quang-yen) anthracite district was well underway.

PRODUCTION

Mineral output value of North Viet-Nam probably rose by about one-tenth in 1964 over that of 1963. Ore and concentrate production still overshadowed output of processed minerals and metals but the latter gained ground. About one-third of total 1964 mineral output was exported.

Anthracite was by far the most important mineral product in 1964, followed by cement and apatite. Pig iron was a new product late in 1963, and output in 1964 probably exceeded 50,000 tons. Iron ore production exceeded 100,000 tons and that of cast iron and steel totaled between 20,000 and 30,000 tons. In addition to commodities for which output data are given in table 7, North Viet-Nam also produced pig iron, cast iron, steel, tin, zinc, asbestos, clays, dolomite, glass sands, kaolin, mica, and pyrite. Production of lead, antimony, copper, manganese, and mercury was about to begin or was newly underway.

---

[14] Prepared by K. P. Wang.

TABLE 7.—North Viet-Nam: Production of selected metals and minerals

(Metric tons)

Commodity [1]	1960	1961	1962	1963	1964 [e]
Metals:					
Chromite	19,400	29,500	32,600	30,300	30,000
Nonmetals:					
Apatite	490,000	563,600	678,000	[r] 925,000	1,000,000
Cement	408,000	457,500	462,000	495,600	649,000
Phosphate rock	51,000	58,100	34,000	[e] 50,000	[e] 50,000
Salt	117,100	106,100	144,000	127,600	150,000
Mineral fuels:					
Coal (mainly anthracite)	2,595,000	2,829,400	3,468,000	3,370,000	3,640,000

[e] Estimated. [r] Revised.

[1] In addition to commodities listed, North Viet-Nam also produced gold, iron ore, pig iron, cast iron, steel, lead, tin, zinc, asbestos, clays, dolomite, glass sands, kaolin, mica, and pyrite and had begun or was about to begin producing antimony, copper, manganese, and mercury. Output levels for iron and steel are indicated in the text; data on production of other commodities are not sufficient to establish reliable estimates.

TRADE

Official statistics on North Viet-Nam's mineral exports are not available; however, anthracite exports are significant, Japan alone having imported 541,265 metric tons in 1963 and 402,855 tons in 1964. Japan, the Soviet Union, and Poland took respectively 139, 59, and 25 long tons of refined tin in 1964. Mainland China has acquired sizable quantities of North Viet-Namese apatite, anthracite, and chromite in recent years. Poland imported 65,400 tons of apatite from North Viet-Nam in 1962, 8,500 tons in 1963, and 30,200 tons in 1964. Rumania was slated to obtain 630,000 tons of apatite yearly from North Viet-Nam beginning in 1965.

Soviet statistics on mineral exports to North Viet-Nam are presented in the absence of official Viet-Namese imports, but it should be recognized that Japan and mainland China are suppliers of lesser consequence. Soviet shipments have been mainly petroleum and metal products. Soviet rolled steel products were essential, but imports also came from Japan as well as mainland China and local industry was being built up.

COMMODITY REVIEW

Metals.—*Chromite.*—North Viet-Nam's somewhat stabilized metallurgical chromite industry produced at about the 30,000-ton-per-year level in 1964. The high-grade alluvial product, extracted much like tin with hydraulic monitors and water troughs, came from a single mine, Co Dinh, in Nong Cong (30 kilometers from Thanh Hoa), which employed about 2,000 workers. Much of this chromite went to mainland China in 1964.

Iron and Steel.—Construction of the new 200,000-ton-per-year iron and steel complex at Thai Nguyen, 75 kilometers north of Hanoi, moved ahead. The first blast furnace went through its initial year of

TABLE 8.—North Viet-Nam: Imports of selected metals and minerals from the Soviet Union

(Metric tons)

Commodity	1962	1963
Metals:		
Aluminum semimanufactures	160	72
Copper semimanufactures:		
Unalloyed	223	271
Alloyed	275	281
Iron and steel:		
Pig iron	2,600	4,000
Ferroalloys	300	400
Semimanufactures:		
Pipes	2,200	1,400
Other	[r] 26,300	21,900
Lead semimanufactures	50	78
Mineral fuels:		
Petroleum refinery products:		
Gasoline	41,600	28,80
Kerosine	24,400	18,800
Diesel oil	24,900	37,400
Lubricating oil	4,800	5,200
Greases	700	800

[r] Revised.

Source: Official Trade Returns of the Soviet Union, 1963 and 1964.

operations, a second one was brought into production in mid-1964, and construction of a third one was started at yearend. These blast furnaces probably were capable of producing 200 to 300 tons of pig iron per day and may be partly anthracite fired. A coking plant and a sintering plant were inaugurated on December 29, 1964, with the coal gas from the coking plant going to the sintering and steel refining plants. Little information was available on steel ingot and rolling facilities, but a 24,000-kilowatt powerplant and an oxygen plant had been completed some time ago and lime as well as dolomite plants were readied for production by yearend 1964.

The Tri Cau open-pit iron mine was being initially developed to supply 300,000 tons of ore annually to Thai Nguyen from a substantial reserve. The Chinese were giving technical assistance to this project along with the steel plant. There was no news on an additional iron district called Bao Ha, reportedly capable of supporting another iron and steel complex in North Viet-Nam.

Tin.—The refined tin output, estimated at 400 to 500 long tons, was derived primarily from facilities in the Tinh Tuc district near the Chinese border in Cao Bang Province. A smelter with a capacity of more than 1,000 tons of refined tin yearly was in existence. As of 1964 there was a fairly modern open-pit tin mine at Tinh Tuc, equipped with Soviet excavators and Czech trucks and surrounded by a dozen smaller properties. A light railroad connects the principal mine with the nearby refinery, and power was supplied by a small hydroelectric plant.

Other Metals and Metallic Ores.—There was once a 6,000-ton horizontal retort zinc smelter at Quang Yen and a mine at Cho Dien in Bac Kan that furnished zinc concentrate (40-percent zinc calamine-type ore). As of 1964, it appeared that this smelter had not been reactivated, but zinc concentrate, possibly on the order of 10,000 to 15,000 tons per annum, was produced at Cho Dien. A second zinc mine, Mo Thiec, in Cao Bang, also was in operation.

Gold was produced on a commercial scale in 1964 at the Tso-pien mine in Hoa Binh, the Tso-lung mine in Bac Kan, and in the Tinh Tuc district.

Nonmetals.—*Cement.*—Haiphong, North Viet-Nam's only cement plant of importance in 1963, had about 500,000-ton annual capacity and four rotary kilns. By 1964, the Rumanian-built new section of this plant (scheduled for completion in 1965) had come into partial production, raising output by nearly one-third over that of 1963. Some small vertical kiln plants also have been constructed in recent years, including Nghe An and Sai Son. North Viet-Nam's cement plants are anthracite fired, but the use of low-grade coals was being investigated.

Phosphates.—North Viet-Nam's phosphate industry, comprised mainly of apatite facilities but with lesser phosphate rock mines and phosphatic fertilizer plants, continued to operate successfully in 1964. Apatite output was more than 1 million tons for the first time, with a substantial increase planned for 1965. All apatite came from the extensive deposits of Laokay (or Lao Cai or Cam Duong) in the northeast. The Rumanians have been responsible for greatly expanding production; in addition to developing the mine, a beneficiation plant near the mine site and a railroad to Haiphong also were built. Laokay was equipped with electric and diesel power shovels working rich zones of open pits; it was also equipped with more than 50 trucks to move the apatite to the railroad. In return for the credit and technical aid extended, the Rumanians were hoping to obtain 630,000 tons of apatite yearly by 1965 from Laokay. Apatite also was shipped to other countries in Eastern Europe and mainland China during 1964.

There were about one-half dozen phosphate plants of various types, which together produced more than 200,000 tons of prosphate fertilizers in 1964. The most important of these was the recently completed Lam Thac superphosphate plant, Soviet equipped and rated at 100,000 tons of product annually. Lam Thao, designed to use about 60,000 tons of apatite yearly, was the first of several such plants planned. It has a 40,000-ton-per-year sulfuric acid unit and produces 20 to 21 percent P_2O_5 grade superphosphate. Construction of fused phosphate and ground phosphate plants at Lam Thao was being considered.

Salt.—Nam Dinh was the leading sea water salt field, providing nearly half of the national output of some 150,000 tons in 1964. Small-scale solar evaporation methods were used.

Mineral Fuels.—*Anthracite.*—In 1964, more than 1 million tons of anthracite, North Viet-Nam's most important mineral product, was exported, principally to Japan and secondarily to mainland China, Hong Kong, France, and the Netherlands. The balance of output was consumed domestically.

Production, primarily from the Hong Gay-Cam Pha (Quany-Yen) district, was 8 percent higher than in 1963. A further 30-percent increase was planned for 1965, despite operational and other difficulties. In April 1964, a "Dien Bien Phu" commemoration campaign to raise coal production was started in the Hon Gay district, indicating initial difficulty in fulfilling targets. Deo Nai was the largest of

Hong Gay's 3 main pits and roughly 17 other mines, contributing one-third of the district's output; some Deo Nai workers had to divert their efforts to defense against air attacks early in 1965. The Hon Gay basin has reserves exceeding 1 billion tons and has coal seams 20 to 80 meters thick. Production has not been commensurate with the favorable resources because of operational problems. Much overburden was stripped with Czech excavators and other equipment in 1964 in preparing for expanding output. An effort was made to produce more lump coal and clean coal in general. The finished coal was shipped out from the established port of Cam Pha.

SOUTH VIET-NAM [15]

The only minerals of economic significance mined in South Viet-Nam during 1964 were coal, sand, and salt. Preliminary surveys in the last few years have indicated deposits of lateritic iron ore in Quang-Ngai Province, kaolin near Dalat, and molybdenite in An-Giang and Krong-Pha Provinces, but in general the country's mineral resource endowment appears meager. Moreover, possible development of these recently discovered deposits virtually has been precluded by the instability of South Viet-Nam's government and by Viet Cong harassments. Despite the difficulties that have beset South Viet-Nam's economy, there has been some growth in the industrial sector, including both expansion of existing facilities and construction of new ones in various industrial estates, such as Bien Hoa and Anhoa-Nongson. This industrial growth was achieved through heavy capital outlays that totaled about $141 million during the 1956–63 period. Industrial investment was particularly heavy during 1962 and 1963, when it averaged approximately $37 million annually.

South Viet-Nam's foreign trade in minerals during 1963, the latest year for which figures are available, centered on the importation of fertilizer materials, semimanufactured iron and steel products, and mineral fuels. These commodities accounted for about 35 percent of the country's total value of imports. South Viet-Nam's mineral exports consisted chiefly of salt and sand, but their combined value amounted to less than 1 percent of total export value. The country's chief exports were agricultural products.

GOVERNMENT POLICIES AND PROGRAMS

South Viet-Nam's industrialization policy was primarily designed to support agriculture and agricultural processing industries. This policy was motivated by the country's paucity of indigenous mineral wealth, by the lack of essential capital and labor for a more complex industrial sector, and by the absence of a stable politico-economic infrastructure to promote rapid development of such an industrial sector. For these reasons and others, the emphasis of South Viet-Nam's industrialization program in the last few years has been upon developing consumer-goods-producing industries.

In South Viet-Nam's efforts to build up its industrial sector, the country has reserved certain large areas for industrial estates to be developed by a central agency. This agency, the Industrial Development Center (IDC), is the principal source of credit and technical assistance for industrial development. Another organization, the Société Financierè pour le Développement Industriel au Viet-Nam (SOFIDIV), was created in 1961 to serve as an industrial development bank, whose activities are closely coordinated with those of IDC.[16]

---

[15] Prepared by Benjamin H. Lim.

PRODUCTION

Complete mineral production figures for South Viet-Nam are unavailable for 1964. However, fair estimates can be made on the basis of past years' production statistics subject to the 1964 political and economic conditions. In general, production of all commodities in 1964 was below the 1963 levels. Chief cited reasons for the lower levels of output were increasing distribution difficulties in the rural areas resulting from Viet Cong actions and a general decrease in demand for foods arising from consumer caution in face of political uncertainty. Coal production in 1964 was seriously curtailed as a result of much damage to the mines caused by a typhoon, which swept the Nongson area in the latter part of 1963. In addition, security around the area became increasingly difficult as the Viet Cong intensified activities. Cement production did not achieve the expected level because of shortages of power, raw materials, and other production factors.

TABLE 9.—South Viet-Nam: Production of metals and minerals

Commodity	1960	1961	1962	1963	1964
Nonmetals:					
Clays ---- thousand cubic meters	28	16	27	35	^{e}120
Salt ---- thousand metric tons	144	100	193	128	^{e}90
White sand ---- thousand cubic meters	20	27	107	255	^{e}220
Cement ---- thousand metric tons	----	----	----	----	75
Mineral fuels:					
Coal, anthracite ---- thousand metric tons	27	57	71	105	^{r}77
Fuel briquets ---- do	^{e}55	^{e}55	^{e}55	NA	NA

^{e} Estimate. NA Not available.

TRADE

South Viet-Nam's lack of production of many mineral commodities continued to force the country to depend on foreign sources for its mineral requirements. As in former years, South Viet-Nam suffered a very unfavorable trade balance. During 1963, the last year for which trade data was available, it imported approximately $167 million worth of goods compared with only $45 million worth of exports, and apparently no improvement in this situation occurred in 1964. Its principal mineral imports have been iron and steel semimanufactured goods, chemical fertilizers, cement and related construction materials, and petroleum products that totaled about $64 million, 38 percent of the total value of imports. South Viet-Nam's main mineral exports, salt and sand, totaled only about 20,595 and 136,885 tons, respectively, in 1963 and were valued at approximately $331,000, less than 1 percent of the total value of its exports. Practically all of the salt and sand was shipped to Japan.

---

[16] Government of South Viet-Nam, Ministry of National Economy, Directorate of Mines, Industries, and Crafts. Industrial Development of Viet-Nam. 1964, 30 pp.

The United States was, by far, South Viet-Nam's largest overall trading partner, which accounted for over $62 million in 1963. Other countries doing substantial trade with South Viet-Nam during 1963 were Taiwan, France, Japan, and Indonesia. Trade relations with France, South Viet-Nam's traditional favorite nation, were strained somewhat during 1964 as a protest against France's neutralization plan for South Viet-Nam and as a disapproval of France's recognition of mainland China.

TABLE 10.—South Viet-Nam: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum all forms:			
Unalloyed	3,200	2,526	Taiwan 1,302; Hong Kong 577; Spain 267.
Alloyed	95	227	United States 141; Spain 37; Philippines 27.
Copper and alloys:			
Unwrought	312	493	Taiwan 184; United States 71; Chile 61; India 57; Japan 50.
Semimanufactures	471	336	Japan 214; Italy 51; Switzerland 15.
Iron and steel semimanufactures	92,443	186,091	South Korea 67,480; Taiwan 54,189; United States 42,112.
Lead and alloys, all forms	109	345	United States 317.
Tin and alloys, all forms ... long tons	295	209	United States 83; West Germany 48; Malaysia 34.
Zinc and alloys:			
Unwrought	618	391	Belgium-Netherlands-Luxenbourg 244 France 95; Hong Kong 42.
Alloy semimanufactures	11	31	All from Japan.
Nonferrous ores, not further described	114	143	Thailand 80; United States 59.
Metal manufactures, mostly of iron and steel.	12,319	6,661	Taiwan 3,205; United States 2,031; France 467; Japan 410.
Nonmetals:			
Asbestos	2	229	Canada 163; Rep. of South Africa 45; South Korea 20.
Cement and lime ... thousand tons	401	446	Taiwan 354; Thailand 83.
Clays	191	171	United Kingdom 152; United States 14; France 4.
Feldspar	90	106	United States 86; Japan 20.
Fertilizers ... thousand tons	71	222	United States 151; Portugal 20; Taiwan 17.
Mica	--------	40	All from Tunisia.
Sulfur	47	69	All from United States.
Mineral fuels:			
Coal	15,513	8,091	Do.
Coke and semicoke	575	881	All from Taiwan.
Coal tars	280	10	All from Japan.
Other crude coal products	129	282	Netherlands 183; Japan 65; France 20.
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	1,085	1,209	Mainly from Indonesia.
Kerosine ... do	516	622	Do.
Fuel oil:			
Distillate ... do	1,106	1,339	Do.
Residual ... do	1,150	1,246	Do.
Lubricating oil ... do	[r] 110	137	Mainly from United States.
Liquefied pertoleum gas	10,132	6,611	All from Indonesia.
Grease	481	973	Mainly from United States.
Vaseline	102	122	All from United States.
Paraffin wax	3,439	3,831	Indonesia 3,207; United States 623.
Asphalt	19,068	18,235	Mainly from Indonesia.

[r] Revised.

Source: Statistiques du Commerce Extérieur du Viet-Nam 1963. Direction Genérale des Douanes, Republique du Viêt-Nam. Saigon 1964, 238 pp.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—In an attempt to reduce its unfavorable balance of trade as well as to build up its industrial sector, the South

Viet-Namese Government invited several teams of foreign experts to make preliminary feasibility studies for establishing an iron and steel rolling mill with an annual capacity of about 30,000 tons. The proposed site of the mill was in the Anhoa-Nongson area. Increased security problems in the area during 1964 prevented rapid development of the project.

Nonmetals.—*Asbestos.*—A new asbestos cement sheet plant at Bien Hoa industrial estate was nearing completion in the latter part of 1964.

Caustic Soda and Chlorine.—Viet-Nam Chlorine and Alkali Co. completed its facilities at Bien Hoa early in 1963. Since the opening of the plant to yearend 1964, it has produced 2,700 tons of hydrochloric acid and 2,100 tons of caustic soda. These quantities were reported to have met one-third of the country's needs for these commodities. The firm also manufactured calcium chloride and chlorine for Saigon's water treatment facilities.

Cement.—The Ha Tien cement plant was dedicated in March 1964. It is expected that it will be some time before all the difficulties are worked out so that rated annual output reaches 300,000 tons. A second cement plant has been proposed. Location of the second plant is planned at Hue.

Fertilizers.—During the latter part of 1964, work was begun on the fertilizer units in the Anhoa-Nongson industrial estate. The complex will include facilities to produce 5 tons of ammonia per hour, 42,000 tons of urea per year, and 48,000 tons of ammonium sulfate per year. Completion date of these plants has been scheduled for the middle of 1966.[17]

Silica.—South Viet-Nam's modern glass factory, Cong Ty Thuy Tinh Viet-Nam, is reported to be able to produce sufficient glassware for household use and for industrial bottling purposes. The firm uses high-grade white sand from Thuy-Trieu and Cam-Ranh.

Mineral Fuels.—*Coal.*—Geologic investigations of the Nongson area disclosed a coal reserve exceeding 3 million tons. An additional 10 million tons was geologically inferred. Both underground and quarrying methods have been used to extract the coal. The coal has been used primarily to supply the Anhoa-Nongson industrial estate for chemical processing and for generating electricity.

Petroleum.—An oil refinery scheduled to be constructed at Nhatrang will be managed by the recently incorporated Viet-Nam Refining Co. It will be the first large industrial firm to be established in South Viet-Nam since 1955. Shareholders in the company are Esso Standard Eastern, Inc., California Texas Oil Corp., Bataafse Petroleum Maatschaappij NV (an affiliate of Royal Dutch Petroleum Co.), and SOFIDIV. The actual construction of the refinery will be financed by a private loan from the United States. The refinery will have a capacity of 24,000 barrels per day. Projected date of completion will be during the second half of 1966.[18]

---

[17] Nitrogen. No. 31, September 1964, p. 11.

[18] Nivolon, F. Oil: Refinery in Central Viet-Nam. Far Eastern Economic Review. V. 44, No. 9, May 28, 1964, p. 477.

Regional Mineral Industry Review of the South Pacific[1]

By Lester G. Morrell[2]

◆

THE RICH and varied occurrences of metallic ores in Australia, extensive nickel deposits on New Caledonia and phosphate rock on several widely scattered small islands were important aspects of the economy of the South Pacific area. Relatively small quantities of gold and nonmetallic minerals produced in New Zealand, Fiji, and the Territory of Papua-New Guinea remained important to the domestic economies of these islands, but had little importance to overall world mineral supplies. The value of mineral commodities produced in this area in 1964 was estimated at $658 million,[3] compared with $585 million in 1963. The year's greatest commodity gains were in bauxite and aluminum, beryl concentrate, manganese ore, nickel smelter products, tin, and coal. Annual increases were recorded in virtually all countries and possessions in the area except Papua-New Guinea, where the drop in output of alluvial gold accounted for a decline of about $160,000.

Mineral industry activities in Australia overshadowed those in all other parts of the South Pacific in 1964. Outstanding developments were the sales contract negotiations and physical preparation for exploiting the rich iron ore discoveries in Western Australia, the initiation of domestic crude oil production, the commissioning of two new steel mills and an alumina refinery, and a start on the new alumina-aluminum project based on Cape York bauxite deposits. The principal mineral development in 1964 in New Zealand was the progress on plans of the New Zealand Steel Co. to use indigenous iron sands as the resource base for a local steel industry. In New Caledonia, additions and expansion of the nickel mining and smelting facilities continued throughout the year. Plans for extensive geophysical studies were announced by the Government Geological Departments of British Solomon Islands and Fiji.

South Pacific sources contributed substantial percentages to the world supply of over 30 mineral and metal commodities in 1964, as detailed in table 1. Australia continued as the world's leading producer of lead, rutile concentrate, and zircon concentrate, ranked third in production of ilmenite concentrate, and fourth in mine production of zinc. New Caledonia was again the non-Communist world's second largest source of nickel. While the area as a whole is essentially self-sufficient in most mineral raw materials, deficiencies exist in crude petroleum, fluorspar, sulfur, fertilizer materials, ores of certain ferroalloying metals, chrysotile asbestos, and industrial diamonds.

---

[1] South Pacific Area, for this purpose includes Australia and New Zealand together with their respective insular territorial possessions and trusts (specifically Nauru and Papua-New Guinea); the British Solomon Islands, Fiji, Gilbert and Ellice, New Hebrides and other islands; and the French Overseas Territories of New Caledonia and French Polynesia. Excluded are the United States Trust Territories of the Pacific Islands and the many small islands having no commercial mineral industries or resources.

[2] North America-South Pacific specialist, Division of International Activities.

[3] Values are given in U.S. dollars.

TABLE 1.—South Pacific contribution to world production of selected mineral commodities [1]

Commodity	1963			1964		
	Metric tons (unless otherwise specified)	Percent of—		Metric tons (unless otherwise specified)	Percent of—	
		Non-Communist world [2] production	World production		Non-Communist world [2] production	World production
Metals:						
Aluminum:						
Bauxite	359,890	1.6	1.2	903,440	3.5	2.7
Metal	41,925	1.0	.8	80,292	1.7	1.3
Beryllium concentrate	112	2.0	1.7	[3] 220	5.2	4.2
Cadmium metal	494	4.8	4.1	[e] 474	4.4	3.7
Copper:						
Mine (content)	114,556	3.0	2.4	105,809	2.7	2.2
Smelter	89,912	2.2	1.8	80,800	1.9	1.5
Gold ... troy ounces	1,188,032	3.1	2.7	1,111,718	2.8	2.4
Iron:						
Ore, concentrate, etc ... thousand tons	5,903	1.8	1.1	6,425	1.7	1.1
Pig iron ... do	3,731	2.0	1.3	4,103	1.9	1.3
Steel, ingots and castings ... do	4,650	1.7	1.2	5,083	1.6	1.2
Lead:						
Mine (content)	416,914	23.5	16.4	380,884	22.4	15.4
Smelter	310,166	17.2	12.2	282,837	15.5	10.8
Manganese ore	65,490	1.0	.4	124,099	1.8	.8
Nickel (content of smelter products and ores)	37,400	14.6	10.5	52,800	18.6	13.6
Silver ... thousand troy ounces	19,652	9.3	7.8	18,359	8.8	7.4
Tin:						
Mine (content) ... long tons	2,852	2.0	1.5	3,400	2.3	1.8
Smelter ... do	2,626	1.8	1.4	3,045	2.1	1.6
Titanium concentrate:						
Ilmenite	206,688	10.4	NA	311,618	13.3	NA
Rutile	186,631	92.6	NA	182,818	95.2	NA
Tungsten concentrate (60 percent WO_3)	1,632	7.7	2.8	1,692	7.2	2.9
Uranium oxide (U_3O_8) [e]	1,100	3.9	NA	335	1.4	NA
Zinc:						
Mine (content)	357,068	13.0	9.8	351,401	11.5	8.8
Smelter	182,662	7.1	5.3	188,508	6.8	5.1
Zirconium concentrate	186,853	[4] 75.0	NA	188,400	[4] 75.0	NA
Nonmetals:						
Cement ... thousand tons	3,841	1.4	1.0	4,445	1.5	1.1
Gypsum	698,350	1.8	1.5	[e] 780,000	1.9	1.7
Magnesite	58,654	1.6	.7	35,667	.8	.4
Monazite concentrate	2,096	[4] 25.0	NA	2,059	[4] 25.0	NA
Phosphate rock ... thousand tons	2,274	5.9	4.4	2,556	5.9	4.3
Pyrite (gross weight) [e]	197,158	1.4	1.0	250,000	1.8	1.2
Mineral fuels:						
Coal, all ranks ... thousand tons	46,795	3.7	1.8	50,063	3.9	1.8

[e] Estimate. NA Not available.

[1] Minerals produced in quantities of less than 1 percent of world supply are omitted.

[2] Excludes Albania, Bulgaria, Mainland China, Cuba, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Rumania, U.S.S.R., North Viet-Nam, and Yugoslavia.

[3] U.S. imports.

[4] Bureau of Mines approximation.

United Nations analysts[4] estimate the total value of South Pacific countries' imports (c.i.f.), in 1964 at $3,826 million, compared with $3,491 million in 1963. Value of exports, f.o.b., for these years totaled respectively $4,359 million and $3,493 million. Much of the area's foreign trade thus summarized was internal; however, Australia and New Caledonia supplied numerous mineral raw materials to the consuming industries of United States, United Kingdom, and Japan. The relative importance of South Pacific supplies to these markets, as recorded in their import records, is tabulated in table 2. The value of United States total and mineral trade with the South Pacific areas, from United States Department of Commerce data, is summarized in table 3.

As an investment area, the countries of the South Pacific were particularly attractive to United States, British, French, Canadian, and Japanese investors.

At the close of 1964, U.S. direct investments in the Oceania Area amounted to $1,582 million.[5] Holdings in petroleum ventures and mining and smelting industries accounted for $544 million. Manufacturing totaled $856 million. U.S. private investment expenditures in minerals and mineral fuels plant and equipment in Australia are expected to rise sharply as a result of U.S. affiliates and subsidiary companies preparing new iron ore and bauxite resources for production. The year's earnings on U.S. mining and smelting investments in Australia totaled $10 million in 1964 ($8 million in 1963) of which $7 million was held for reinvestment in the country and $3 million returned to United States as income. Petroleum search expenditures by U.S. companies in Australia during the year amounted to $6 million. On the basis of company projections investments in Australian petroleum and mining and smelting plants are expected to rise from $94 million in 1964 to $209 million in 1965 and $229 million by 1966.

---

[4] United Nations, Statistical Office, Monthly Bulletin of Statistics, Aug. 1965, v. 19, No. 8, New York.

[5] U.S. Dept. of Commerce, Office of Business Economics, Survey of Current Business, v. 45, No. 9, Sept. 1965. pp. 24–25, 30.

TABLE 2.—Principal Consumer Markets for selected South Pacific Mineral Products[1]

(Metric tons unless otherwise specified)

Commodity	United States			United Kingdom			Japan		
	Total imports	Imports from South Pacific	Percent of total	Total imports	Imports from South Pacific	Percent of total	Total imports	Imports from South Pacific	Percent of total
Metals:									
Aluminum:									
Alumina and bauxite .... thousand tons	10,427			337			51	48	94.1
Metal .... do	358	3	0.8	271	4	1.5	19		
Beryllium concentrate	4,921	220	4.5	NA			NA		
Cadmium metal	501	18	3.6	1,425	260	18.2	NA		
Copper: (content)									
Ore and concentrate[2]	38,951			NA	NA		620,381	47,421	7.6
Metal, refined and ingot	100,037			358,442	5,189	1.4	119,523	8,339	7.0
Iron and steel:									
Scrap .... thousand tons	256	([3])	([3])	5			4,986	370	7.4
Pig iron .... do	668	([3])	([3])	201	NA		3,350	22	.7
Steel ingots, blooms, etc .... do	313			261	29	11.1	NA		
Lead: (content)									
Ore and concentrate[2]	116,180	20,401	17.6	25,812	12,035	46.6	51,704	20,729	40.1
Metal, pigs and bars	191,542	38,498	20.1	183,314	130,652	71.3	67,513	22,422	33.2
Manganese ore and concentrate .... thousand tons	[4] 1,298			316			[5] 368	[5] 17	[5] 4.6
Nickel: (gross weight)									
Ore and concentrate				5			1,143,228	1,085,529	95.0
Matte, and speiss				62,620	NA	NA	5,429	5,338	98.3
Silver, base and refined bullion .... thousand troy ounces	51,674	1,651	3.2	21,517	728	3.4	9,937		
Tungsten concentrate	[6] 1,428	[6] 52	3.6	5,425	250	4.6	2,852	270	9.5
Titanium concentrates	209,377	116,212	55.5	NA	[7] 87,469	NA	185,986	63,554	34.2
Zinc: (content)									
Ore and concentrate[2]	282,528	2,705	1.0	104,728	80,721	77.1	288,477	29,616	10.3
Metal, blocks, pigs, slabs	121,669	349	.3	162,757	27,097	16.6	68,627	5,429	7.9
Zirconium concentrate	40,291	38,921	96.6	32,904	[8] 34,898	NA	NA	[9] 22,435	
Nonmetals:									
Asbestos, crude, all types	716,093	431	([3])	160,082			143,969	712	.5
Gypsum .... thousand tons	5,667	7	([3])	142	NA		91	27	29.7
Phosphate rock .... do	158	4	2.5	1,436	229	15.9	2,316	166	7.2
Mineral fuels:									
Coal, bituminous .... do	277			66			13,233	4,356	32.9

NA Not available.

[1] United States and Japan import data for year 1964. United Kingdom for 1963.

[2] Quantities shown for Japan are gross weight of ores and concentrates.

[3] Insignificant.

[4] Manganese content.

[5] 1963 data.

[6] Tungsten content.

[7] Rutile and ilmenite exports to United Kingdom reported by Australia for 1963.

[8] Exports to United Kingdom reported by Australia for 1963.

[9] Exports to Japan reported by Australia for 1963.

TABLE 3.—United States trade with South Pacific Area, total and mineral categories[1]

(Thousand dollars)

	Imports		Exports	
	1963	1964	1963	1964
Australia:				
Minerals, metals, and fuels	27,256	29,381	45,918	51,283
Total merchandise	314,390	273,866	436,714	625,633
New Guinea:				
Minerals, metals, and fuels	----------	----------	15	12
Total merchandise	2,380	1,351	1,044	1,166
New Zealand:[2]				
Minerals, metals, and fuels	21	11	9,062	11,340
Total merchandise	171,579	148,124	71,670	86,683
British West Pacific Islands:				
Minerals, metals, and fuels	----------	----------	45	27
Total merchandise	8,169	7,235	1,289	2,204
French Pacific Islands:				
Minerals, metals, and fuels	90	47	2,042	2,213
Total merchandise	666	932	8,093	13,392
Oceania total:				
Minerals, metals, and fuels	27,367	29,439	57,082	64,875
Total merchandise	497,184	431,508	518,810	729,078

[1] Mineral categories include SITC Commodity Classifications 271, 273–6 inclusive, 281–6 inclusive, 321 331, 332, 341, 513–5 inclusive, 661–3 inclusive, 671–9 inclusive, 681–9 inclusive.

[2] Includes Western Samoa.

Source: U.S. Department of Commerce, Bureau of the Census, United States trade statistics.

The Mineral Industry of Australia

By Lester G. Morrell[1]

◆

A NUMBER of historic industrial events marked 1964 as an outstanding year for the Australian mineral industry. Pipeline shipments of petroleum were initiated from Australia's first commercial oilfield, and several significant discoveries of oil and gas were announced. Two new steel mills and an alumina refinery were commissioned. Work was started on construction of an alumina plant at Gladstone, Queensland, at which bauxite from the Weipa deposits on Cape York Peninsula will be processed. In Western Australia, nearly $2,240 million[2] in long-term contracts with Japanese steel interests provided the stimulus to intensive development plans related to the vast iron ore resource.

According to preliminary estimates, the value of Australia's mine and quarry products reached a record $526 million in 1964, an increase of about 13 percent, compared with 1963. The increase is attributed to greater output of bauxite, coal, ilmenite concentrate, and tin; and to higher prices for lead and zinc that more than offset slightly smaller outputs of these commodities in 1964. Reflecting labor troubles at the Mount Isa mine and cutback in production at Broken Hill, mine outputs of copper, lead, zinc, and silver were less than in 1963. Production of gold declined about 7 percent to less than 1 million ounces, and uranium oxide output, as scheduled, fell to less than 340 tons in 1964. On the basis of the indicated trend, primary processing and recovery of minor byproducts added about $179 million, bringing the total value of Australia's mineral industry products to about $706 million. This represents about 3.5 percent of the 1964 gross national product ($20,332 million) estimated by the Commonwealth Bureau of Census and Statistics.[3]

The growing value of mine output and total value of mineral products including primary processing and byproducts has been recorded for selected recent years as follows:

---

[1] North America-South Pacific specialist, Division of International Activities.

[2] Where necessary, values have been converted from Australian pounds (A£) at the rate of A£1=US$2.24.

[3] Digest of Current Economic Statistics, Canberra, Australia, No. 69, May 1965. 13 pp.

Year	Mine output value		Total value including domestic primary treatment	
	Million Australian pounds	Million U.S. dollars	Million Australian pounds	Million U.S. dollars
1955	149.4	334.7	184.5	413.3
1960	181.2	405.9	234.4	525.1
1961	180.2	403.6	237.1	531.1
1962	187.6	420.2	255.1	571.4
1963	208.3	466.6	281.1	629.7
1964	235.0	526.4	315.0	705.6

In 1963, the most recent year for which category summaries are available, metals accounted for 47 percent of the total value of mine output. The value of coal made up 32 percent, and nonmetallic and construction materials 21 percent. The 10 most important commodities in order of ex-mine value were (in million dollars) coal—151.6, lead—62.7, copper—56.4, gold—32.9, silver—25.3, zinc—18.1, iron ore—13.7, rutile concentrate—13.0, limestone—9.6, and tin—6.9.

The value added to mineral products as a result of primary treatment and recovery of byproducts amounted to $164.6 million in 1963. For 1961–63, the additional value was credited to the following commodities:

Commodity	Value (million dollars)		
	1961	1962[r]	1963
Copper	9.2	12.6	14.1
Lead	16.4	19.7	20.4
Zinc	21.5	26.0	26.4
Tin	1.1	1.1	.9
Iron ore	79.3	90.9	93.2
Bauxite		1.1	9.6
Total	127.5	151.4	164.6

[r] Revised.

Excluding operations employing fewer than four persons, 924 mines and quarries were active in 1963, compared with 951 in the preceding year. The breakdown in 1963 recorded 146 metal, 189 coal mines, and 589 nonmetallic and construction material operations. Salaries and wages paid to employees totaled $138.0 million in 1963; $133.7 million in 1962. Metal mining has been the largest employer of labor in most recent years, averaging about 19,000. Employment in coal mining has gradually declined from 20,000 workers in 1959 to 17,250 in 1963. Nonmetallic mineral mines employ about 2,900, and construction material quarries, approximately 5,400. Total mine and quarry workers in Australia numbered 44,848 in 1963; 45,225 in 1962.

GOVERNMENT POLICIES AND PROGRAMS

The Federal policy of encouraging foreign investment has been largely responsible for the recent development of rich bauxite and iron ore resources and expansion in coal and ferrous and base metal metallurgical facilities. Though Japan looms as the principal market for most of these products, United States, Canadian, British, and French private interests have joined with Australian investors in the tremendous financial undertakings. Typical of the international participation is the consortium of companies that comprise the Queensland Alumina Ltd. venture at Gladstone. In Western Australia the Hamersley iron ore development will be served by a railroad built by an American-Canadian-Australian group using Japanese rails. Locomotives will be from the United States, ore trucks from Japan and Australia. French and American companies will dredge the harbors; British firms will supply ore-handling jetty and loaders as well as the electric generators for the mine.

Legislation enacted in 1963 and 1964 clarified and modified features of the Income Tax Act dealing with allowable deductions in respect to petroleum prospecting, transfers, and production. Under the Gold Mines Industry Assistance and Development Acts (both of which apply until mid-1965), payments in 1964 totaled $1,655,474, compared with $1,904,426 in 1963. Late in 1963 the Copper Bounty Act, which paid $1,453,428 in 1963, was extended to January 1, 1966. In May 1964, changes in the Income Tax and Social Services Contribution Assessment Act provided for share capital deductions under certain circumstances to petroleum prospecting and mining companies. Up to October 1964, the Federal Government's contribution to the search for petroleum amounted to more than $33.6 million. On October 28, the Government announced changes in the Petroleum Search Subsidy Scheme which exempt from subsidy certain areas around discovery wells and fields. The possibility exists of imposing a limit on subsidy in the case of extraordinarily high-cost drilling projects.

PRODUCTION

Australian mineral industry output advanced again in 1964, with increases recorded for about half of the commodities contained on the nation's extensive and varied list of mineral products. Greatest gains were in bauxite and refined aluminum, iron and steel, manganese ore, ilmenite and fuels. Anticipated moderate declines were recorded in gold and uranium, and, as a result of labor troubles and voluntary cutback, output of lead, zinc, copper, and silver were also down compared with 1963 level.

TABLE 1.—Australia: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Aluminum:					
Bauxite	70,549	16,232	30,021	359,890	903,440
Refined metal	11,842	13,416	16,460	41,925	80,292
Antimony, metal content	156	120	67	75	275
Beryl	193	311	227	112	[1] 220
Bismuth (in ore) kilograms	120	[r] 410	44	----------	----------
Cadmium, refined metal	305	316	359	494	503
Chromite	537	----------	375	163	----------
Cobalt (recoverable cobalt in zinc concentrate)	13	13	16	16	[e] 11
Columbium and tantalum concentrate	11	14	20	14	[e] 14
Copper:					
Ore and concentrate (content)	111,191	97,161	108,689	114,556	105,809
Blister	72,177	63,500	88,739	89,912	80,800
Refined (primary)	71,786	64,748	80,725	85,734	84,519
Gold troy ounces	1,086,709	1,076,292	1,068,837	[r] 1,023,970	[r] 965,721
Iron and steel:					
Iron ore thousand tons	4,425	5,428	4,921	5,603	6,118
Pig iron do	2,928	3,210	3,489	3,658	4,050
Ferroalloys: [2]					
Ferrochromium, high carbon	607	716	580	1,112	2,480
Ferro and silico manganese	8,268	2,448	22,393	38,937	47,297
Ferrosilicon	7,316	8,275	7,557	8,435	5,095
Steel ingots and castings thousand tons	3,753	3,947	4,234	4,650	[r] 5,098
Steel semimanufactures [2] do	3,015	2,374	2,716	2,869	NA
Lead:					
Ore and concentrate (content)	313,109	273,987	376,050	[r] 416,876	380,884
Refined	192,947	164,868	193,177	228,210	206,371
Bullion, for export	53,569	48,862	74,283	81,956	76,466
Manganese ore	61,619	88,814	72,796	36,785	62,639
Selenium kilograms [e]	1,590	1,360	1,590	1,590	1,590
Silver:					
Ore and concentrate (content) thousand troy ounces	15,216	13,059	17,554	[r] 19,642	[r] 18,412
Refined do	8,085	7,099	7,378	8,871	9,128
Tin:					
Ore and concentrate (content) long tons	2,202	2,745	2,715	2,852	[r] 3,604
Smelter do	2,254	2,546	2,704	2,626	[r] 3,021
Titanium concentrates:					
Ilmenite	108,297	169,071	182,375	[r] 204,209	311,618
Rutile	90,060	103,059	121,108	186,631	182,818
Tungsten ores and concentrates (60 percent WO_3 basis)	1,882	2,600	1,765	1,627	1,687
Uranium oxide (U_3O_8) [e]	[r] 1,170	[r] 1,422	[r] 1,247	[r] 1,101	335
Zinc:					
Ore and concentrate (content)	322,585	316,151	[r] 342,949	[r] 357,111	350,153
Smelter	122,160	140,920	170,623	182,662	188,508
Zirconium concentrate	104,004	138,651	135,991	186,853	[r] 186,105
Nonmetals:					
Asbestos:					
Chrysotile, fibre and fines	1,035	879	839	748	[e] 1,572
Crocidolite	13,129	14,313	15,868	11,385	[r] 10,954
Barite	11,600	19,525	12,735	8,352	12,548
Cement thousand tons	2,791	2,858	2,933	3,119	3,626
Clays:					
Bentonite and bentonite clay	581	908	797	1,555	687
Brick clay and shale thousand tons	4,619	4,414	[r] 4,453	4,745	NA
Cement clay and shale do	212	191	316	225	NA
Fire clay do	160	205	200	198	NA
Kaolin and ball clay do	49	52	37	52	NA
Other do	472	477	398	393	NA
Diatomite	4,734	5,504	7,429	5,927	2,995
Feldspar	8,549	8,341	8,650	8,984	[r] 8,259
Fluorspar	7	----------	----------	15	NA
Gypsum	590,201	619,696	641,249	698,350	793,327
Limestone, including shell and coral thousand tons	5,760	6,245	6,479	6,650	7,267
Lithium, minerals [3]	16	127	137	250	264
Magnesite	63,164	100,381	63,189	57,860	35,054
Mica:					
Trimmed and crude	298	84	----------	----------	NA
Scrap	294	84	----------	[r] 7	NA
Damourite	568	516	493	500	NA
Monazite concentrate	368	1,572	827	2,096	2,059

See footnotes at end of table.

TABLE 1.—Australia: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Nonmetals—Continued					
Phosphate rock	2,358	4,952	4,455	5,004	5,780
Pyrites, including cupreous pyrites	242,460	216,848	150,950	197,158	240,661
Salt ... thousand tons	471	517	544	592	NA
Talc and soapstone	16,431	15,071	15,232	14,157	15,153
Mineral fuels:					
Coal:					
Bituminous[4] ... thousand tons	22,931	24,391	24,862	25,256	27,802
Lignite ... do	15,207	16,540	17,412	18,753	19,338
Coke:					
High-temperature ... do	2,675	2,756	2,818	2,896	3,091
Low-temperature ... do	771	777	774	[r]725	779
Fuel briquets ... do	1,537	1,871	1,816	1,917	1,885
Petroleum:					
Crude ... thous. 42-gal. bbls	-----	-----	-----	-----	1,487
Refinery products:					
Gasoline ... do	31,963	34,347	35,089	35,089	40,809
Kerosine and jet fuels ... do	3,352	3,537	3,448	3,673	4,459
Distillate fuel oil ... do	19,950	19,319	19,077	20,369	19,549
Residual fuel oil ... do	21,241	25,067	28,582	32,151	33,493
Lubricants ... do	208	152	106	551	1,400
Other products ... do	3,045	5,194	5,285	4,767	5,366
Refinery fuel and loss ... do	6,871	6,442	8,398	9,435	9,809
Total ... do	86,630	94,058	99,985	106,035	114,885

[e] Estimate.
[r] Revised.
NA Not available.
[1] U.S. imports.
[2] Ferroalloys and steel semimanufactures are reported for fiscal years ending Nov. 30.
[3] Petalite, amblygonite, and spodumene.
[4] Includes semianthracite and subbituminous.

TRADE

The value of mineral trade, both exports and imports, was at a record level in 1964. Total value of principal mineral exports in 1964 has been estimated at $266.1 million, compared with $202.0 million in 1963. While most of the principal export commodities showed an increase over the previous year, lead and zinc accounted in 1964 for a record 47 percent of the value of mineral exports because of high unit prices for these metals. Coal exports accounted for 17 percent.

Principal mineral imports in 1964 were valued at $275.7 million, about 7 percent higher than in the previous year. The value of crude oil made up nearly 73 percent of the total. Materials used in fertilizer manufacture, phosphate rock and elemental sulfur together valued at $25.5 million, ranked second only to petroleum as Australia's most valuable mineral import. The shortage of domestic copper in 1964 was reflected in record imports of ingots and refined forms.

According to 1963 data, Japan and the United Kingdom continued as Australia's largest mineral export markets, taking respectively 29 percent and 27 percent of the total exports. The crude oil that dominated imports was virtually all from Indonesia and Middle East countries.

TABLE 2.—Australia: Exports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962–63	1963–64	Principal destinations, 1963–64
Metals:			
Aluminum:			
Bauxite	69,933	236,800	Japan 190,917; West Germany 44,864.
Scrap	250	364	Japan 308.
Unwrought	1,871	5,271	United Kingdom 4,025.
Semimanufactures	346	262	New Zealand 175; Hong Kong 22.
Beryllium ore and concentrate	118	118	All to United States.
Cadmium, refined metal [3]	260	372	United Kingdom 248; India 27.
Copper:			
Ore and concentrate, gross weight	41,112	40,053	Japan 40,025; United Kingdom 28.
Blister, cement, etc	1,347	989	Belgium-Luxembourg 511; Japan 419.
Scrap	354	1,999	Japan 1,904; West Germany 83.
Ingots, blocks, billets	23,780	25,691	Japan 12,961; United Kingdom 5,139.
Semimanufactures	2,987	3,971	New Zealand 3,731; United Kingdom 111.
Pipe, tubes and wire	2,366	1,684	New Zealand 1,427; Philippines 97.
Gold:			
Ore and concentrate, content ... troy ounces	[3] 44,166	[3] 50,099	NA.
Crude bullion, content ... do	16,018	562	United Kingdom 415; New Zealand 147.
Mint bullion ... do	386,768	449,003	Hong Kong 448,993; Fiji 10.
Sheet, strip, dust ... do	8,182	7,680	New Zealand 7,066; United States 350.
Iron and steel:			
Iron ore and concentrate	115	12,397	Japan 12,242.
Iron pyrites and cinder	120,236	108,428	Japan 108,121.
Scrap	221,665	357,258	Japan 337,891; West Germany 8,474.
Pig iron	161,918	74,219	Japan 38,547; Philippines 8,030.
Steel ingots, blooms, slabs, etc	55,510	79,088	United Kingdom 53,627; Spain 11,416.
Steel semimanufactures	256,774	368,571	Mainly to New Zealand.
Lead:			
Ore and concentrate, gross weight	136,859	120,379	United States 46,022; United Kingdom 26,664.
Refined pig	171,982	171,747	United States 38,114; Japan 15,694.
Bullion, lead and silver-lead	79,330	84,669	United Kingdom 61,689; West Germany 10,422.
Manganese ore	25,484	27,593	Japan 27,570.
Platinum-group metals:			
Ore and concentrate, gross weight ... kilograms	1,882	1,865	NA.
Platinum metals [4] ... troy ounces	896	548	Japan 300; United Kingdom 227.
Silver:			
Ore, concentrate, crude bullion, content ... thousand troy ounces	[3] 7,970	[3] 8,101	NA.
Mint bullion ... thousand troy ounces	239	4,537	United Kingdom 1,332; New Zealand 3.
Sheet, strip, dust ... do	4	33	All to New Zealand.
Tantalite-columbite concentrate	12	20	United States 11; United Kingdom 9.
Tin:			
Ore and concentrate, gross weight ... long tons	114	34	All to United Kindgom.
Unwrought ... do	5	6	NA.
Titanium concentrates:			
Ilmenite, minimum 45 percent TiO_2	146,472	226,011	United Kingdom 110,650; United States 37,997.
Rutile, minimum 90 percent TiO_2	121,155	159,791	United States 73,824; Sweden 3,592.
Tungsten concentrates:			
Scheelite	300	1,062	West Germany 659; United Kingdom 205.
Wolframite	460	483	United Kingdom 310; Japan 122.
Zinc:			
Ore and concentrate, gross weight	280,735	231,256	United Kingdom 159,297; Japan 37,008.
Ingots, blocks, slabs, etc	100,315	84,874	United Kingdom 22,099; India 12,587.
Semimanufactures	788	1,984	New Zealand 589; Singapore 565.
Other forms	339	138	NA.
Zircon concentrate, minimum 30 percent $ZrSiO_4$	132,200	185,943	United States 45,507; United Kingdom 37,815.
Nonmetals:			
Abrasives:			
Industrial diamonds [4] ... carats	43,149	100,639	United Kingdom 46,171; United States 41,495.
Other natural abrasives	38	16	NA.
Asbestos:			
Crocidolite	5,646	3,838	Singapore 1,641; Japan 671.
Other, amphibole and chrysotile	132	5	NA.
Cement, portland	5,480	6,095	Nauru 3,506; Christmas Island 1,219.
Clay, fire, sillimanite and others	707	1,632	New Zealand 1,174; Japan 260.

See footnotes at end of table.

TABLE 2.—Australia: Exports of metals and minerals[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1962–63	1963–64	Principal destinations, 1963–64
Nonmetals—Continued			
Gemstones:			
Diamond [4] carats	1,601	1,357	Belgium-Luxembourg 636; United Kingdom 387.
Opal [4] value, thousand A£ [5]	2,347	2,869	Japan 1,921; Hong Kong 446.
Other, cameo, intaglio do	118	153	United Kingdom 83; France 20.
Graphite	11	4	NA.
Gypsum	159,902	183,925	New Zealand 80,609; Philippines 38,393.
Magnesite	323	743	New Zealand 151; United States 147.
Mica, crude	27	32	All to New Zealand.
Monazite concentrate	1,842	2,325	United States 1,328; France 390.
Salt	76,065	109,070	Japan 78,471; New Zealand 27,582.
Stone, construction value, thousand A£ [5]	12	4	NA.
Talc and steatite	3,762	5,166	United Kingdom 1,444; New Zealand 1,158.
Mineral fuels:			
Coal and lignite [6] thousand tons	2,719	3,866	Japan 3,587; South Korea 71.
Coke	31,483	80,707	New Caledonia 73,720; New Hebrides 5,829.
Petroleum refinery products:			
Gasoline, total thou. 42-gal. bbls	1,302	1,861	New Zealand 1,813; Fiji 22.
Kerosine and jet fuel do	762	292	New Zealand 249; Papua-New Guinea 21.
Distillate fuel oil do	5,997	3,819	New Zealand 2,497; Mozambique 332.
Residual fuel oil do	9,459	7,923	New Zealand 2,568; Singapore 2,105.
Lubricants do	115	426	Republic of South Africa 166; United Kingdom 94.
Other products do	143	54	NA.

NA Not available.

[1] Periods shown are fiscal years July 1 to June 30.

[2] Data not available on quantities of cadmium exported in lead and zinc concentrates.

[3] Quantities given are for 1962 and 1963 calendar years, respectively.

[4] Includes reexports.

[5] One Australian pound (A£) = US$2.24.

[6] Lignite (brown coal) exports are negligible. Bulk of exports is New South Wales bituminous coal.

TABLE 3.—Australia: Imports of metals and minerals[1]

(Metric tons unless otherwise specified)

Commodity	1962–63	1963–64	Principal sources, 1963–64
Metals:			
Aluminum:			
Scrap	2,005	2,120	Canada 1,708; New Zealand 345.
Pigs, ingots, blocks, etc	28,805	3,026	United States 1,662; Canada 930.
Semimanufactures	2,774	1,233	United Kingdom 551; United States 406.
Pipe, tubes, powder, wire	1,037	1,117	United Kingdom 387; United States 270.
Antimony:			
Ore and concentrate, gross weight	45	43	NA.
Metal	399	842	Mainland China 608; United Kingdom 234.
Bismuth metal	17	18	United Kingdom 17.
Chrome ore and concentrate	11,246	16,719	U.S.S.R. 8,230; Philippines 4,369.
Cobalt and cobalt base alloys	69	63	Federation of Rhodesia and Nyasaland 32; Belgium-Luxembourg 14.
Copper:			
Scrap	88	283	New Zealand 220; Papua 40.
Ingots, blocks, billets	1,258	5,118	Federation of Rhodesia and Nyasaland 2,541; United States 2,080.
Semimanufactures	967	144	United Kingdom 126.
Pipe, tubes, wire	128	151	Canada 97; United Kingdom 32.
Gold:			
Matte, gold content troy ounces	138	----------	
Crude bullion, gold content do	155,294	148,968	Fiji 100,137; New Guinea 42,964.
Refined bullion do	169	210	West Germany 201.

See footnotes at end of table.

TABLE 3.—Australia: Imports of metals and minerals[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1962–63	1963–64	Principal sources, 1963–64
Metals—Continued			
Iron and steel:			
Ore and concentrate, includes pyritic materials.	298,177	278,643	New Caledonia 278,558.
Scrap	84	228	West Germany 132; Sweden 75.
Ferroalloys:			
Ferrochromium	2,150	3,245	Japan 1,698; Federation of Rhodesia and Nyasaland 920.
Ferromanganese	6,466	11,859	Republic of South Africa 9,024; Japan 1,411.
Ferromolybdenum	78	264	U.S.S.R. 171; United Kingdom 36.
Ferrosilicon	5,721	10,348	Republic of South Africa 9,434; Norway 448.
Other	2,517	3,346	United States 1,072; New Caledonia 922.
Ingots, blooms, etc	569	3,500	Japan 2,954; United Kingdom 455.
Semimanufactures	218,323	182,426	Mainly from United Kingdom and Japan.
Lead and lead base alloys	2,319	239	United Kingdom 57; Other Commonwealth countries 175.
Magnesium and magnesium base alloys	207	497	United States 215; Norway 174.
Manganese ore:			
Battery grade	1,195	3,471	Ghana 3,353; Japan 58.
Metallurgical grade	54,071	46,865	Republic of South Africa 46,063.
Mercury 76-pound flasks	1,837	1,511	Spain 505; mainland China 292.
Nickel:			
Matte and other crude products	305	84	All from Canada.
Pigs, ingots, granulated	634	962	United Kingdom 575; Canada 380.
Bars, rods, anodes	702	624	Canada 333; United Kingdom 152.
Platinum-group metals troy ounces	3,536	4,343	United Kingdom 3,917; West Germany 288.
Silver:			
Matte, silver content do	5,635	----------	
Crude bullion, silver content do	93,653	102,453	Fiji 47,945; New Zealand 29,892.
Refined bullion do	13,073	11,546	United States 10,807; United Kingdom 680.
Tin and tin base alloys long tons	1,911	1,325	Malaya 1,280; Singapore 25.
Tungsten and tungsten base alloys	16	35	United Kingdom 24; Canada 5.
Zinc and zinc base alloys	1,868	198	New Zealand 98; United Kingdom 60.
Nonmetals:			
Abrasives:			
Industrial diamond carats	303,549	512,062	Republic of South Africa 281,724; United States 111,215.
Pumice and tripoli	1,606	1,675	United States 736; New Zealand 572.
Garnet	45	106	United States 100; United Kingdom 3.
Flintstone and pebbles	599	1,147	Canada 508; United Kingdom 156.
Asbestos:			
Chrysotile	25,822	25,963	Canada 24,212; Republic of South Africa 976.
Crocidolite	34	81	Republic of South Africa 48; Canada 33.
Amosite	6,749	6,722	Republic of South Africa 6,362; Canada 355.
Other	2,671	3,209	Canada 2,774; United States 217.
Boron minerals, crude and concentrate	1,942	991	United States 962.
Cement, portland	28,818	28,097	United Kingdom 17,928; Taiwan 5,860.
Clays:			
China, kaolin, pottery	18,271	21,236	United Kingdom 16,456; United States 4,708.
Fire and ball	4,045	6,803	United States 3,498; United Kingdom 2,007.
Bentonite	9,587	12,223	United States 11,822; United Kingdom 365.
Other	6,197	9,424	United States 6,386; Republic of South Africa 2,239.
Cryolite, natural and synthetic	5,006	4,477	United States 3,225; Denmark 1,219.
Diatomite	4,327	4,652	United States 4,537.
Fertilizer materials:			
Phosphate rock thousand tons	1,722	2,021	Nauru 942; Christmas Island (Indian Ocean) 583.
Basic slag	2,066	----------	
Nitrogenous, all types	52,560	137,092	Japan 93,100; Italy 10,918.
Potassic, all types	59,263	98,226	West Germany 37,854; United States 32,445.
Mixed and others	24,490	17,562	West Germany 8,436; Italy 5,443.
Fluorspar	7,707	6,010	Republic of South Africa 3,054; United Kingdom 2,844.

See footnotes at end of table.

TABLE 3.—Australia: Imports of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1962–63	1963–64	Principal sources, 1963–64
Nonmetals—Continued			
Gem stones:			
Gem diamond .... carats	21,964	29,783	Belgium-Luxembourg 10,168; United Kingdom 10,057.
Cameos, intaglios, etc. .... value, thousand A£ [2]	475	705	Australia reimports 459; India 94.
Graphite:			
Colloidal	54	131	NA.
Flake	315	453	Malagasy 233; Ceylon 108.
Crystalline	104	157	United States 92; Commonwealth countries 59.
Amorphous	770	546	Ceylon 287; United Kingdom 66.
Iodine, crude	2	------	
Iron oxide pigments	4,325	5,089	Spain 2,081; West Germany 1,424.
Kyanite	331	1,350	India 1,043; United States 195.
Lithopone	1,521	1,090	United Kingdom 530; Belgium-Luxembourg 247.
Magnesite, crude, calcined and fused	3,925	50,857	United States 23,348; Japan 10,472.
Mica:			
Block or sheet	18	34	India 33.
Splittings	81	111	India 109.
Ground and scrap	529	583	United Kingdom 126; Republic of South Africa 109.
Quartz crystals	47	96	NA.
Salt	7,331	7,185	United Kingdom 7,157.
Sillimanite	195	449	Commonwealth countries 319; Republic of South Africa 130.
Stone, construction .... value, thousand A£ [2]	241	306	Italy 238; Belgium-Luxembourg 11.
Sulfur, elemental	227,340	309,189	United States 175,358; Mexico 79,861.
Talc, steatite, and chalk	3,206	2,675	Mainland China 2,188.
Vermiculite	1,738	2,029	Republic of South Africa 2,026.
Mineral fuels:			
Asphalt, bitumen and pitch:			
Natural minerals	1,805	1,517	Trinidad and Tobago 980; United States 415.
Petroleum derivatives	6,274	1,636	Singapore 1,041; United Kingdom 309.
Coal tar and coal tar pitch	8,477	7,677	United States 5,183; United Kingdom 2,489.
Carbon black	3,924	NA	NA.
Coal	8,056	13,022	Republic of South Africa 9,061; United States 2,330.
Coke	29,518	37,882	United States 37,572.
Petroleum:			
Crude .... thousand 42-gallon barrels	105,374	109,014	Indonesia 24,786; Saudi Arabia 24,519.
Refinery products:			
Gasoline .... do	6,911	7,321	Iran 3,141; Venezuela 1,029.
Kerosine and jet fuel .... do	2,802	2,067	Indonesia 556; Iran 490.
Distillate fuel oil .... do	929	1,014	Aden 340; Netherlands Antilles 166.
Residual fuel oil .... do	440	568	United States 254; Kuwait 140.
Lubricants .... do	1,730	1,395	United States 701; Venezuela 330.
Petroleum turpentine .... do	392	395	Indonesia 200; United States 92.
Other products .... do	253	509	NA.

NA Not available.

[1] Periods shown are fiscal years July 1 to June 30.

[2] One Australian pound (A£) = US$2.24.

COMMODITY REVIEW

METALS

Aluminum.—Bauxite production in 1964 exceeded 900,000 tons, 2.5 times more than the 1963 output. During the first 9 months, 62 percent of production was from the Weipa deposits on Cape York Peninsula and 36 percent from the Darling Range in Western Australia. Although a substantial quantity of bauxite was exported to Japan, most of the 1964 output from Weipa went to the affiliated Comalco Aluminum (Bell Bay) Ltd. plant in Tasmania for manufacture into aluminum. In the Darling Range, Alcoa of Australia Pty. Ltd. mined and shipped bauxite to the new 210,000 tons per year alumina refinery at Kwinana. First shipments from Kwinana to the company's smelter at Point Henry, Victoria, were received in February 1964. Throughout the balance of the year Kwinana alumina also was shipped to Japan.

The extensive, proved deposits of commercial grade bauxite on the Gove Peninsula, Northern Territory, remained undeveloped. Various industrial groups have applied for lease concessions, but none have been granted.

Production of primary aluminum in 1964 represented 86 percent of the national capacity (40,000 tons at Port Henry and 52,000 at Bell Bay). Consumption of Australia-made aluminum ingot by domestic fabricating industries in 1964 was estimated at about 65,000 tons, compared with 36,500 in 1963 and 16,000 in 1962. Exports of Australian aluminum ingot during the calendar year 1964 totaled 1,537 tons.

Construction started early in 1964 on the Queensland Alumina Ltd. plant at Gladstone. The plant, designed for 600,000 long tons of alumina per year and scheduled for completion in 1967 will cost $116 million. Alumina will be allocated to the share-holding partners in proportion to their holdings: Kaiser Aluminum and Chemical Corp.—52 percent, Aluminum Limited—20 percent, Compagnie de Produits Chemiques et Electrométallurgiques Péchiney—20 percent, and Conzinc Riotinto of Australia Ltd.—8 percent.

Expansion programs in virtually all segments of the Australian aluminum industry were announced during 1964 and the early months of 1965. Commonwealth Aluminium Corp. Pty., Ltd. (Comalco) plans to increase Weipa bauxite capacity from 600,000 to 2,250,000 long tons annually by 1967, and to modernize and expand the primary aluminum capacity at Bell Bay. The Yennora plant in New South Wales, which produces rolled products, is to be equipped with sheet and plate mills costing about $7.6 million. Alcoa of Australia Ltd. planned to double the capacity of the Kwinana alumina refinery to accommodate an order to supply 200,000 long tons per year to American Metal Climax Inc.

Copper.—In 1964, mine output of copper was nearly 8 percent below the record level of 1963, mainly as a result of the labor dispute that closed the Mount Isa Mines, Ltd. operation during the latter half of the year.

The tight supply condition that developed from the 1963 surge in domestic consumption, the Mount Isa trouble, and an announcement that Mount Morgan Ltd. was negotiating to sell its entire future output of blister copper in Japan, prompted the Government to impose an export embargo, effective November 21, 1964, on matte, blister, and semimanufactured products. Excepted from the export ban are copper in concentrates and fully manufactured products. The bulk of the reported 11,818 tons of copper exported in 1964 was contained in concentrates consigned to Japan. Copper concentrates shipped to Australian smelters in 1964 contained 83,271 tons, compared with 102,533 in 1963.

The principal industrial facilities and quantities of their products in recent years are summarized in the accompanying table.

TABLE 4.—Major copper industry facilities

Facility	Production (metric tons of copper)[1]		
	1961	1962	1963
Mines:			
Mount Isa Mines Ltd	58,644	75,975	74,709
Mount Morgan Ltd	8,201	7,483	8,613
Broken Hill field	2,449	3,522	3,805
Mount Lyell Mining and Railway Co. Ltd	11,847	13,408	15,598
Electrolytic Zinc—Rosebery	1,011	1,307	1,476
Ravensthorpe Copper Mines, N.L	1,484	995	1,378
Tennant Creek field	7,712	7,639	7,714
Smelters:			
Mount Isa Mines Ltd	39,580	65,534	65,655
Mount Morgan Ltd	6,926	7,811	8,163
Electrolytic Refining and Smelting Co.—Port Kembla	5,814	[r] 3,287	1,805
Mount Lyell Mining and Railway Co. Ltd	11,180	13,106	14,290
Refineries:			
Mount Isa Mines Ltd	41,255	57,664	64,812
Electrolytic Refining and Smelting Co.—Port Kembla	12,875	11,156	10,632
Mount Lyell Mining and Railway Co. Ltd	10,618	11,905	12,053

[r] Revised.

[1] Metal content of ore for mines; blister copper for smelters; and electrolytic for refineries.

Mount Isa's June 30, 1964, annual report (prior to the shutdown) reported an increase in ore reserves to 34.5 million tons at 3.5 percent copper, and completion of the new shaft which will have a daily hoisting capacity of 14,000 tons. The Mount Morgan Ltd. new 10-year contract to export 8,000 tons of blister copper per year to Sumitomo Metal Mining Co. Ltd., Japan, may be curtailed by the embargo on exports. At yearend, preparations at Cobar, New South Wales, were on schedule for initial production at 325,000 tons of ore per year to commence in June 1965. The planned use of diesel ore transport equipment in cut-and-fill stopes and other novel features will rank this as a unique, modern mining operation. Late in 1964 opencut mining of copper ore was started in a new prospect known as the "Hundred of Goyer," Northern Territory, by Australian Mining and Smelting Co. Pty. Ltd. The oxide ore is stockpiled, and 400 tons of sulfide ore per day are being concentrated at the Rum Jungle treatment plant.

Gold.—Mine production of gold continued to decline. Closure of the mines of Great Western Consolidated N.L., and Sons of Gwalia Ltd. late in 1963, and smaller output at many of the surviving mines, despite government assistance, resulted in a drop of nearly 7 percent below the 1963 production.

Subsidy payments under the Gold Mining Industry Assistance Act amounted to $1,412,925 in 1964, compared with $1,700,599 in 1963. Under the Development Assistance Act, 1964 payments were $242,549, compared with $203,840 in 1963.

Mines in Western Australia contributed 74.1 percent, Queensland 10.4 percent, Northern Territory 8.4 percent, and other States 7.1 percent of the 1964 total production. By source material, gold output of Australian mines and refineries in 1964 and preceding years was as follows:

Source material	Troy ounces		
	1962	1963	1964 [e]
Mines:			
Bullion [1]	955,285	895,202	811,301
Copper ore and concentrate	78,804	91,742	118,093
Lead concentrate	12,286	13,820	12,385
Lead-copper concentrate	18,021	18,820	19,271
Zinc concentrate	4,441	4,386	4,671
Total	1,068,837	1,023,970	965,721
Refineries:			
Newly won gold [2]	1,026,623	958,381	892,726
Scrap	21,806	20,404	19,282
Imported, including scrap	138,643	161,373	141,458
Total	1,187,072	1,140,158	1,053,466

[e] Estimate.
[1] Includes alluvial and retorted gold.
[2] Gold content recovered from minerals produced in Australia.

According to Commonwealth Bureau of Census and Statistics data for 1963, the latest year available, the Australian gold mining industry employed an average of 5,287 workers in 257 mines (compared with 5,290 workers in 286 mines in 1962). Western Australia goldfields accounted for 146 mines and 4,833 workers. Principal companies, all in Western Australia, and their scale of operation in 1963 were as follows:

Company	Location	Ore treated (long tons)	Gold produced (troy ounces)	Average number of employees
Central Norseman Gold Corp	Norseman	189,248	102,702	359
Gold Mines of Kalgoorlie (AUS) Ltd	Fimiston	517,958	144,722	875
Great Boulder Gold Mines Ltd	do	445,042	118,349	685
Great Western Consolidated NL	Bullfinch	124,062	15,159	86
Hill 50 Gold Mine	Mt. Magnet	162,538	78,196	228
Lakeview and Star Ltd	Fimiston	690,537	177,292	962
Moonlight Wiluna Gold Mines Ltd	Mt. Ida	28,914	14,633	73
North Kalgurli (1912) Ltd	Fimiston	371,967	85,908	461
Sons of Gwalia Ltd	Gwalia	159,651	31,344	217

The bulk of Australian gold production has been refined by the Royal Mints at Perth and Melbourne. On August 1, 1964, the Melbourne Mint refinery was closed in preparation for transfer to the new Australian National Mint at Canberra. A relatively small quantity of bullion and other gold-bearing material was refined in the smelters at Port Pirie and Port Kembla and by industrial refineries in Sydney and Melbourne.

Domestic industrial consumption of gold in Australia was estimated at 78,248 ounces in 1964, compared with 47,881 in 1962 and 61,042 in 1963.

Iron and Steel.—The year 1964 was outstanding for the Australian iron and steel industry. Production of iron ore was up about 9 percent, and pig iron and ingot steel were both approximately 10 percent above 1963 levels. Steel production for the first time exceeded 5 million tons. Development and expansion programs initiated in the

1961–64 years assured continued rapid growth in virtually all phases of the iron and steel industry.

Iron Ore.—The Iron Monarch and Iron Prince open pit iron ore operations west of Whyalla, South Australia, supplied about 4.6 million tons, including 800,000 tons from the scree plant. Cockatoo Island, Western Australia, shipped 1.4 million tons of ore to the Broken Hill Pty. Co. Ltd. (BHP) and subsidiary Australian Iron and Steel Pty. Ltd. and Commonwealth Steel Co. Ltd. plants.

Reserves in Western Australia, estimated at 14 billion tons of iron ore,[4] have been the subject of long-term contract-sales negotiations with the Japanese steel industry totaling over $202 million. Principal deals completed and accepted as of April 1965 are summarized as follows:

Organization	Shipments		Ore		Capital (million A£)
	Start	Years	Million metric tons	Percent Fe	
Mount Newman Iron Ore Co. Ltd	1969	21-22	100	62–64	65
Hamersley Iron Pty. Ltd	August 1966	16–18	65–75	62–64	45
Mount Goldworthy Mining Associates	April 1966	7	16.5	61–64	25
Western Mining Consortium	April 1966	8	5	58–60	4
Francis Creek Iron Mining Co. Pty. Ltd	1967	8	3	60–62	NA
Cleveland Cliffs-Mitsui Trading	1968	21	71.5	63 (pellets)	54

NA Not available.

At yearend preparations were completed for the first ore shipments from the recently installed mining and loading facilities provided by BHP at Koolan Island, near Cockatoo, in Yampi Sound. This expansion program, which cost about $16 million, will permit an annual production of 3 million tons from this locality. Ore reserves on the two islands have been revised to 83 million tons averaging 58 to 66 percent iron.

The Government of Western Australia also had agreements with BHP to develop the Koolyanobbing ores as the basis of an integrated steel industry at Kwinana, with Cleveland Cliffs Iron Co. (United States) and Mitsui Trading Co. (Japan) to develop iron ore at Robe River, and with Mineral Mining and Exports (W.A.) Pty. Ltd. to develop ore at Scott River.

The Savage River, Tasmania, project of Pickands Mather & Co. (United States) and Mitsubishi Company (Japan) has resulted in a $65 million project to export 40 million tons of 67 percent Fe pellets to Japan over a 21-year period.

---

[4] Eight billion long tons hematite-goethite ore of at least 60 percent iron; 6 billion tons pisolitic limonite-goethite ranging 50–60 percent iron.

Pig Iron.—Pig and foundry iron output in 1963 and preceding years was by the following producers:

Company	Plant	Thousand metric tons		
		1961	1962	1963
Broken Hill Pty. Co. Ltd	Newcastle	939	997	1,223
Do	Whyalla	251	220	188
Australian Iron and Steel Pty	Port Kembla	1,949	2,226	2,180
Commonwealth Steel Co	Waratah	5	5	4
Wood-Distillation, Charcoal-Iron and Steel Industry	Wundowie	52	47	47

With commissioning of the new No. 2 blast furnace in April–May 1965, and modernizing the present furnace, the pig iron capacity at Whyalla will be raised to nearly 900,000 tons per year early in 1966.

Steel.—The record ingot steel production in 1964 was achieved through improved operating techniques and intensive use of existing facilities, however, two new 100-ton basic oxygen furnaces that will add 500,000 tons per year ingot capacity at Whyalla were scheduled to come into service early in 1965. Construction completed during the year at the products plants included new pig mill and soaking pits at Newcastle, plate and finishing rolls and tinplate equipment at Port Kembla, and the structural mill, bloom mill, and soaking pits at Whyalla. At Kwinana, plans were in an advanced stage, site work had commenced, and contracts had been let for the new blast furnace and steelworks equipment by yearend.

Production of ingot and various products by Broken Hill Pty. Co. Ltd. and its subsidiaries (Australian Iron and Steel Pty. Ltd. and Commonwealth Steel Co. Ltd.) were reported as follows:

Commodity	Thousand metric tons		Commodity	Thousand metric tons	
	1963[1]	1964[1]		1963[1]	1964[1]
Steel ingots	4,325	4,822	Rod	153	302
Blooms and slabs	3,772	4,143	Cold rolled strip	60	74
Sheet bars, billets, etc	1,997	2,213	Tinplate	214	201
Plate and strip	1,458	1,577	Steel castings	10	11
Merchant	1,310	1,393	Iron castings	106	135

[1] Company year ending May 31.

Lead and Zinc.—The mines of Broken Hill, which normally account for 75 to 80 percent of the national production of lead and zinc, reported smaller tonnages of ore treated in 1964. Although two of the four companies in this group recorded tonnage increases, the combined drop of 105,500 tons treated at Zinc Corporation and New Broken Hill Consolidated, Ltd. accounted for most of the 9 percent decrease in lead and 2 percent decrease in zinc from the 1963 records.

By principal producers, mine output of lead and zinc for the three most recent available years was as follows:

Mine	Metric tons					
	1961		1962		1963	
	Lead	Zinc	Lead	Zinc	Lead	Zinc
North Broken Hill	49,393	39,984	57,556	47,235	74,649	60,565
Broken Hill South	31,476	27,350	36,704	31,168	37,620	31,444
Zinc Corporation	70,067	71,078	108,285	81,093	122,362	86,469
New Broken Hill Consolidated	54,809	85,995	92,830	86,303	98,920	91,423
Mount Isa	45,727	33,752	63,648	45,421	67,821	37,901
Read-Rosebery	11,859	40,750	14,365	48,687	14,692	49,267

For the company year ending June 30, 1964, lead concentrates smelted at Mount Isa yielded 60,353 tons (60,587 tons in 1963) of lead bullion. As in previous years this was exported to the subsidiary Britannia Lead Co. Ltd. at Northfleet, in the United Kingdom, for refining. Lead concentrates from the Broken Hill mines are divided between the Broken Hill Associated Smelters Pty. Ltd. at Port Pirie, South Australia, and the Sulphide Corp. Pty. Ltd. smelter at Cockle Creek, New South Wales. In 1963 the Port Pirie smelter produced 219,019 tons refined lead, 6,770 tons antimonial lead, and 6,921 tons of sheathing alloy. The Cockle Creek smelter produced 21,193 tons lead bullion and copper-lead dross containing 772 tons of lead (with 241 tons of copper). Output of refined zinc from the Cockle Creek plant in 1963 was 4,470 metric tons (10 percent above the design capacity). At Risdon, Tasmania, the Electrolytic Zinc Company of Australasia Ltd. also reported a record 137,960 tons refined zince output in 1963. About 70 percent of the zinc concentrates consumed at Risdon was from Broken Hill, the balance from the Read-Rosebery mine on the west coast of Tasmania.

Domestic consumption of primary lead and zinc in 1961–63 was as follows:

	Metric tons		
	1961	1962	1963
Lead:			
Domestic origin	26,700	31,000	43,600
Imported	3,600	3,600	1,600
Total	30,300	34,600	45,200
Zinc:			
Domestic origin	77,500	83,400	93,300
Imported	1,200	2,700	300
Total	78,700	86,100	93,600

Manganese Ore.—Mine production of manganese ore resumed a normal level in 1964, after a severe drop in 1963. The bulk of production in recent years has been metallurgical grade ore from Peak Hill and Pilbara areas of Western Australia. Principal producers were Mount Sydney Manganese Pty. Ltd. and Westralian Ores Pty. Ltd. In November 1964, after a 6-year ban on manganese leases, the Western Australia Government reopened about one-fifth the area of the State for pegging of manganese claims. Several companies showed interest in prospects.

Significant deposits of manganese ore have been proven-up by Broken Hill Pty. Co. Ltd., at Groote Eylandt, in the Gulf of Carpentaria, Northern Territory. These deposits are considered satisfactory for ferromanganese furnaces at Bell Bay, Tasmania. Early development of the leases and outlay of approximately $4.5 million in mine and shipping facilities for a minimum production rate of 70,000 tons per year is anticipated.

Silver.—Reflecting the drop in output of lead, zinc, and copper concentrates with which it is coproduced, mine production of silver was about 6 percent below the record level of 1963. Six large base-metal mines normally account for about 98 percent of the Australian silver. In 1963, quantities credited to these mines were: Mount Isa—6,087,261 troy ounces, North Broken Hill—4,018,704, Broken Hill South—1,968,243, Zinc Corporation—2,795,936, New Broken Hill Consolidated—2,614,811, and Read-Rosebery—1,579,335.

The bulk of the silver refined in Australia is recovered by Broken Hill Associated Smelters Pty. Ltd. at Port Pirie, South Australia; 7,593,775 ounces was recovered by the company in 1963. Electrolytic Refining and Smelting Co. of Australia Pty. Ltd., at Port Kembla, refined 1,066,238 ounces and the mints at Melbourne [5] and Perth recovered 212,893 ounces in 1963 principally from Australian gold bullion.

Source materials of silver produced in recent years were as follows:

Source material	Thousand troy ounces		
	1961	1962	1963
Mines:			
Copper ore and concentrate	668	844	910
Lead ore and concentrate	10,695	14,792	16,835
Lead-copper concentrate	799	995	942
Zinc concentrate	679	698	731
Gold bullion, etc	218	225	224
Refineries:			
Smelter products	6,903	7,130	8,659
Mint, doré bullion	197	249	235

Consumption of silver in Australia for coinage and industries was estimated at 7,810,843 troy ounces in 1963.

Tin.—Mine production of tin in concentrates and output of refined tin in 1964 were up respectively 25 and 15 percent above the records reported in 1963. Although all areas except South Australia contribute to total production, mines in Queensland and Tasmania supply the bulk (76 percent in 1963) of Australian production. According to the last official count, made in 1962, there were more than 300 tin mines in Australia. Principal mine producers of tin concentrates and quantities of contained tin produced in 1963 were:

---

[5] The Melbourne Mint ceased refining operations on August 1, 1964, in preparation for transfer to the new mint facility at Canberra.

Area and producer	Location	Tin content (long tons)
Queensland:		
Ravenshoe Tin Dredging Ltd	Battle Creek	396
Tableland Tin Dredging N.L.	Smith Creek	354
Tasmania:		
Aberfoyle Tin N.L.	Rossarden	480
Renison Associated Tin Mines N.L.	Renison Bell	227
Storeys Creek Tin Mining Co. N.L.	Gladstone	49
Endurance Tin Mining Co. N.L.	Mount Cameron	76
Western Australia:		
Mineral Concentrates Pty. Ltd	Moolyella	127
H. V. Leonard	do	67
Cooglegong Tin Pty. Ltd	Pilbara	68
J. A. Johnston	Eleys	63

Two new mines in New South Wales commenced operations in 1964. Ardlethan Tin N.L. at Ardlethan began a 1,000-long ton-per-day opencut and mill operation in June, and Tullabong Syndicate Ltd., near Condoblin, operated 7 months producing 203 long tons of tin concentrate. A number of announced plans for expansions and new mine developments could make Australia self-sufficient within 2 years and eventually an exporter of tin.

Domestic consumption of primary tin was estimated at 4,482 long tons in 1962, 4,669 long tons in 1963, and 4,575 long tons in 1964. Approximately 60 percent of Australia's industrial use is for manufacture of tinplate, production of which totaled 207,622 long tons (75 percent of installed capacity) in 1963 and 205,500 long tons in 1964.

Virtually all domestic tin concentrates are smelted and refined by the two tin smelters in Sydney, New South Wales. Production of refined tin in 1964 was 3,021 long tons. In 1963 the production was 2,626 long tons.

Titanium Concentrates.—Beach sand operations in Western Australia reported record output of ilmenite in 1964, up 50 percent above the quantity reported in 1963. The increase was largely due to the start of production at the new 100,000-ton capacity plant of Western Mineral Sands Pty. Ltd., at Chapel. Increased capacity has been achieved at other sites by adoption of more efficient methods such as suction dredges and pinched-sluice and rotating cone concentrators.[6]

To accommodate the growing exports of ilmenite concentrate from the west coast producers, new bulk storage and ship-loading facilities have been provided at the port of Bunbury. In 1964 approximately 17 percent of the total output went to domestic producers of pigments. Titanium dioxide pigment production capacity was estimated at 32,500 tons per year early in 1964, after additions to the Australian Titan Products Pty. Ltd. plant at Burnie, Tasmania, and erection of a new pigment plant of Laporte Titanium (Australia) Ltd. at Bunbury, Western Australia. Approximately 34,500 tons of Western Australia ilmenite was consumed in manufacture of 16,400 tons of pigments at Burnie, Tasmania, in 1963. By the end of 1964 annual capacity for production of titanium dioxide was about 35,000 tons, which would require about 70,000 tons of ilmenite concentrate.

---

[6] Blaskett, K. S., and S. B. Hudson. Concentration of Zircon, Rutile, and Ilmenite From Beach Sands. Eighth Commonwealth Min. Met. Congress, 1965.
Hughes, T. H., and F. R. Williams. Laboratory Investigation on the Design and Performance of a Rotating Cone Concentrator. Eighth Commonwealth Min. Met. Congress, 1965. 11 pp.
Pullar, S. S. Developments in Separating Equipment in the Australian Heavy Mineral Sands Industry. Eighth Commonwealth Min. Met. Congress, 1965. 13 pp.

Production of rutile concentrates in 1964, nearly all of which was from Queensland and New South Wales beaches, was slightly below that of 1963. However, exports in 1964, estimated at 197,000 tons were the largest recorded. Three contracts with U.S. pigment manufacturers totaling 80,000 to 90,000 tons per year were the principal stimulants, although many countries continued to depend on supplies of Australian rutile concentrates. Domestic consumption of rutile, mainly for coating welding rods, was estimated at 2,000 tons in 1963.

NONMETALS

Asbestos.—Production of blue (crocidolite) asbestos in 1964 was the lowest in a decade. The sharp decline from record Australian output in 1962 is attributed to strong competition in world markets and completion in 1962 of deliveries to the U.S. stockpile. All crocidolite production was by Australian Blue Asbestos Pty. Ltd., Wittenoom Gorge, Western Australia.

Production of chrysotile fibre and fines in 1964 was more than double that of 1963. The Comet Mine at Marble Bar, near Lionel, Western Australia, commenced operation late in 1963 and provided most of the increase.

Domestic consumption of asbestos, mostly based on imports from Canada, rose in 1964 to a high level. Manufacture of asbestos cement building sheets, over 31 million square yards, was the highest on record.

Gem Stones.—Australian opal mines reportedly maintained a high level of production in 1964, although details are not available. In 1963 value of production was a record $2.84 million, and value of exports for the first half of 1964 was $2.9 million, the highest ever recorded for a 6-month period. The bulk of opal production was from the Coober Pedy and Andamooka fields in South Australia. To December 1963, historical value of opal production from these two fields was respectively $6.9 million and $4.7 million. Increased activity was reported during 1964 from Lightning Ridge, New South Wales.

Sapphires produced in Queensland and New South Wales were valued at $70,466 in 1963. Two outstanding sapphires were found in 1964, a yellow stone of 84 carats at Willows Siding and a 78-carat green and yellow at Sapphiretown, both in the Anakie field in central Queensland.

Chrysoprase deposits discovered in 1962 in the Marlborough Creek area, Rockhampton District, Queensland, yielded initial shipments valued at $14,112 in 1963. A description of the occurrence has been published.[7]

Gypsum.—Production of gypsum in 1964 was 13 percent greater than the previous record output of 1963. On the basis of detailed data for 9 months, virtually all the additional production was from South Australia. With the completion of loading facilities and rail connections to serve the extensive deposits at Lake MacDonnell, it is expected that South Australia output will continue to rise. Proven reserves of high-grade gypsum at Lake MacDonnell exceed 500 million tons.

---

[7] Brooks, J. H. Marlborough Creek Chrysoprase Deposits. Queensland Govt. Min. J. (Brisbane, Queensland, Australia), March 1964, pp. 135–140.

The leading consumer industries, plaster of paris and portland cement manufacturers, absorbed respectively about 330,000 and 164,000 tons in 1964.

Production of plaster of paris totaled 274,200 tons in 1964, an increase of nearly 9 percent above 1963. Usage in manufacture of building sheets declined as a result of competition from chipboard-type sheets.

Phosphate Fertilizer Materials.—Although production of phosphate rock was at a record level in 1964, Australian output was insignificant in the national requirement for about 2 million tons per year. To further stimulate the search for an indigenous supply, the Commonwealth Government in November announced intention to seek the cooperation of State agencies and private enterprise. Two international consultants[8] have been engaged by the Bureau of Mineral Resources to assist in a review of existing data and techniques. Early in 1965 phosphate prospecting permits covering 20,000 square miles were granted to four companies.[9]

About 10,000 feet of test drilling by the Bureau of Mineral Resources in the Hundred of Goyder, Northern Territory, has defined about 2 million tons of phosphate rock of undetermined grade. Other prospects of possible commercial interest are known in the Amadeus Basin and Rum Jungle, both in Northern Territory.

The Phosphate Fertilizer Bounty Act of 1963 provides a bounty of $6.72 per long ton on enriched forms of superphosphate on a pro rata basis according to their soluble phosphorous pentoxide content. This legislation, which will be effective for 3 years from August 14, 1963, and an unprecedented surge in use and new techniques of applying fertilizers has prompted major producers to expand production capacity. Actual output of superphosphate was 3,726,000 tons in 1964, compared with 3,142,000 tons in 1963.

Salt.—Throughout 1963, the most recent year for which data are available, domestic and oversea market conditions continued favorable. The year's output was about 9 percent above that of the previous year. South Australian producers accounted for 79 percent of the national total. The principal producer, ICI Alkali (Australia) Pty. Ltd., increased its solar evaporation output at Dry Creek, but details are not available. Plans were announced by Augusta Salt Ltd. for a major expansion of the field previously operated by Solar Salt Ltd., at Spencer Gulf, near Port Patterson. The planned development of this field, which will cost $6.9 million, is expected to yield 300,000 to 500,000 tons per year when complete.

In Western Australia, Shark Bay Salt Pty. Ltd., a new company, was scheduled to complete development of a solar saltfield and provide plant and shiploading facilities at Useless Loop, on Shark Bay.

---

[8] R. P. Sheldon, U.S. Geological Survey, and T. H. Van Andel of the Scripps Institution of Oceanography, University of California.

[9] International Mineral and Chemical Development Co.—1,200 square miles, Phosphate Exploration Co. of Perth—792 square miles, Electrolytic Zinc Co. of Australia Ltd.—7,750 square miles, and Cyanamid Australia Pty. Ltd.—10,600 square miles.

Shipments at a rate of 100,000 tons per year were expected to commence late in 1964. A final capacity of 250,000 tons per year was anticipated.

An oil test well recently drilled by American Overseas Petroleum Ltd. north of Augathella in central Queensland is reported to have intersected a saltbed 1,544 feet thick at a depth of 6,400 feet.

Apparent domestic consumption of salt was estimated at 476,400 tons in 1963, compared with 475,700 tons the previous year. Recorded consumption by the two principal consumer industries for recent fiscal years (July 1 to June 30) was:

	Thousand metric tons		
	1959–60	1960–61	1961–62
Industrial chemicals	278	273	263
Salt refining	150	163	183

Sulfur.—Reflecting a heavy industrial demand, mainly from the fertilizer industry, Australian production of pyrites and byproduct sulfur from petroleum as well as imports of elemental sulfur were at a high level throughout 1964.

Supplementing the two sulfur recovery plants of Petroleum Refineries (Australia) Pty. Ltd. at Altona, Victoria and Port Stanvac, South Australia, a third plant, operated by Shell Refining (Australia) Pty. Ltd. at Clyde, New South Wales, commenced recovery early in 1964. The new plant, of 50-ton daily capacity, brings the national daily recovery capacity to 120 long tons. The mine sources of pyrite (including base metal sulfides) concentrates accounted for 106,164 tons of contained sulfur in 1964. At Risdon, Tasmania, the Electrolytic Zinc Co. of Australasia Ltd. added a fourth contact acid unit in 1964, bringing the total sulfuric acid production capacity at that plant to 244,000 tons per year.

Output of sulfuric acid rose to 1,559,000 tons, compared with the previous record of 1,337,000 tons in 1963. The great bulk of sulfur consumption was for manufacture of sulfuric acid. Source materials used and quantities of acid produced from each in 1963 were as follows:

Source material	Thousand metric tons	
	Amount used	Acid produced
Elemental sulfur	224	659
Pyrite	267	338
Zinc concentrate	275	224
Lead concentrate	332	77
Other materials	22	39
Total	XX	1,337

XX Not applicable.

Zircon.—Recovery of zirconium concentrate, a product of the beach sands industry, remained at a high level through 1964. With the reduction in supplies available from the United States, Australian zircon has been in strong demand on world markets. The bulk of future production through 1965 and 1966 has been contracted for, principally by United States buyers. Stockpiles of zirconium concentrates accumulated by east coast beach sand producers have been exhausted. Continued favorable marketing conditions are foreseen in the fact that expansion programs of east coast sand producers are directed mainly to rutile, rather than zircon.

MINERAL FUELS

The gradual increase in use of petroleum fuels at the expense of solid mineral fuels continued into 1964. Black coal and lignite accounted for slightly less than 51 percent of the energy generated in Australia during the 1963–64 fiscal year. The Joint Coal Board Annual Report for 1963–64 summarized Australian consumption of primary energy by source in terms of standard coal equivalent for recent fiscal (July 1 to June 30) years as follows:

Source	1961–62		1962–63		1963–64	
	Thousand metric tons SCE[1]	Percent	Thousand metric tons SCE[1]	Percent	Thousand metric tons SCE[1]	Percent
Black coal	18,909	41.3	18,948	39.3	19,918	38.3
Lignite	5,851	12.8	6,114	12.7	6,440	12.4
Petroleum products	17,689	38.7	19,142	39.7	21,545	41.4
Firewood	977	2.1	894	1.9	871	1.7
Hydropower	2,312	5.1	3,110	6.4	3,214	6.2
Total	45,738	100.0	48,208	100.0	51,988	100.0

[1] Standard coal equivalent.

Black Coal.[10]—Production of black coal in 1964 was again at a record level, 10 percent above the peak established in 1963. Mines in New South Wales accounted for an increase of 1.7 million tons. Exports of black coal, over 90 percent of which went to Japan, were also at a record level in 1964.

TABLE 5.—Black coal production by States

(Thousand metric tons)

State	1962	1963	1964
New South Wales	19,334	19,245	20,961
Queensland	2,845	3,298	3,870
South Australia	1,414	1,536	1,768
Tasmania	277	210	151
Victoria	58	52	49
Western Australia	934	915	1,003
Total	24,862	25,256	27,802

According to Bureau of Census and Statistics, in 1963, the Australian black coal mining industry numbered 185 mines, of which all but 9 were underground operations. Employees totaled 15,838. More than half of these (8,012) were employed in 24 large mines that had payrolls of 200 or more. The New South Wales industry comprised 94 mines (of which 3 are opencut), employing 11,534. Queensland had 74 mines (5 opencut) with 2,770 employees.

---

[10] Includes bituminous, semianthracite, and subbituminous varieties.

Total tonnage of black coal mined in the 1963–64 fiscal year by underground methods was 23.4 million, 86.4 percent of the total. Productivity in the principal producing States, by types of mines, for the past 3 fiscal periods, as reported by the Joint Coal Board was as follows:

State	Production per man-shift[1] (long tons)					
	Underground mines			Opencut mines		
	1961–62	1962–63	1963–64	1961–62	1962–63	1963–64
New South Wales	6.4	6.7	7.4	23.9	18.5	20.1
Queensland	3.5	3.8	4.3	11.5	11.7	17.3
South Australia	----------	----------	----------	16.8	21.3	22.7
Western Australia	4.3	4.4	4.4	10.5	11.6	12.5
Tasmania	4.4	4.6	5.3	12.8	10.5	----------
Total	5.7	6.0	6.6	15.6	16.6	19.2

On the basis of all employees.

Despite the inroads of petroleum, consumption of black coal continued to increase; the rise in fiscal 1963–64 was approximately equal to the combined increases of the previous 4 fiscal years. Distribution to principal consumer industries in recent years was as follows:

Industry	Consumption (thousand metric tons)		Industry	Consumption (thousand metric tons)	
	1962–63	1963–64		1962–63	1963–64
Iron and steel	5,259	5,541	Ships bunkers	119	145
Electricity	7,935	4,895	Others	2,684	1,644
Railways	1,567	704			
Town gas	1,486	740			
Cement	867	553	Total domestic consumption	20,260	14,540
Metallurgical coke	343	318			

Of the total 4.89 million tons exported in calendar year 1964, New South Wales mines supplied 3.85 million tons, and Queensland, 1.03 million tons. Japan imported 4.6 million tons of Australian coal.

Theiss-Peabody-Mitsui Coal Pty. Ltd. announced in December 1964 an agreement for export of 30.1 million tons of Moura coking coal to Japanese steel interests over 13 years beginning in 1965. A shorter, more direct rail line (115 miles) between the mine and the port at Gladstone was scheduled for completion in 1968. Several other Queensland and New South Wales coal companies have offered to supply coal to Japanese steel makers.

Brown Coal.—Again in 1964, Victoria, the sole producing State, reported record output of brown coal. The bulk of production was from the open pit mines of the State Electricity Commission of Victoria (S.E.C.) in Latrobe Valley at Yallourn and Morwell.

A 1,500-tons-per-hour dredger commenced operation at Morwell in April, and the first 200,000-kw. unit for the new Hazelwood power station was commissioned in October 1964. When complete in 1971, this station will have a generating capacity of 1.2 million kilowatts and brown coal consumption will run about 13 million tons annually.

Approximately two-thirds of the 1964 output of brown coal went directly to on-site powerplants operated by S.E.C. Three percent was used for gasification, and 29 percent went into the manufacture of briquets. According to the S.E.C. Annual Report for fiscal 1962–63, production of 1.83 million tons of briquets required 5.59 million tons of Yallourn brown coal. Coal from the Morwell opencut is unsuited for briquet manufacture. The 1962–63 fiscal year pattern of consumption for briquets produced at the Morwell and Yallourn briquet works was as follows: Domestic use—23 percent, industries—27 percent, Gas and Fuel Corporation at Morwell—10 percent, and S.E.C. power stations—40 percent.

Coke.—Reflecting the general expansion in the iron and steel industry, production of metallurgical coke in 1964 was up about 4 percent over that of 1963. According to the annual report of Broken Hill Pty. Co. Ltd., the coke ovens at the Newcastle steelworks produced 1,155,834 tons in the company year ending May 31, 1964. This increase of 14 percent resulted from rebuilding of No. 2 battery and erection of new coal and coke handling equipment. During the same period, coke production at the Australian Iron and Steel Pty. Ltd. Port Kembla works amounted to 1,862,289 tons. A plan to provide an additional battery of ovens at Port Kembla was announced in November 1964.

The State coke works at Bowen and the Highmoor Coke Ovens at Ipswich, Queensland, reported production of respectively 22,013 and 776 tons in 1963. Low temperature coke, including coke breeze produced at gasworks throughout Australia, amounted to 809,000 tons in 1963, a drop of 156,000 tons from the previous year.

Petroleum.—Australian production of crude petroleum was initiated with official opening of the Moonie to Brisbane pipeline on March 25, 1964.

In 1964 a record 210 wells were completed and approximately 1,070,000 feet of hole drilled in Australia and its Territories, an increase of more than 60 percent over the corresponding data for 1963. Seventy percent of the total footage was drilled in Queensland, 9 percent in Western Australia, 7 percent in South Australia, and 6 percent in New South Wales. During the year several significant discoveries of oil and gas were reported. In the Surat Basin, Queensland, potential gas producers were found in four wells by Associated Australian Oilfields N.L., and potential oil producers, by Amalgamated Petroleum Exploration Pty. Ltd. at Combarngo and by Union-Kern-A.O.G. at Alton. A natural gas flow of 4.3 million cubic feet per day was reported at Gilmore No. 1 by Phillips Petroleum Company. In South Australia, Delhi Australian Petroleum Ltd. discovered gas and condensate at Gridgealpa, and at Mereenie, 140 miles south of Alice Springs, Exoil (N.T.) Pty. Ltd. completed four high-flow gas wells.

Australia's first successful offshore well, Grippsland Shelf No. 1 in Victoria, drilled by Esso Exploration Australia Inc., encountered a heavy gas flow at a depth of 4,321 feet in February 1965. Western Australia Petroleum Pty. Ltd. (WAPET) has found promising flow of oil and gas from zones up to 7,000 feet deep in three wells on Barrow Island (800 miles north of Perth). Two wells yielded tests of 500 to 1,000 barrels per day of high gravity oil, and all three were found capable of gas production.

Domestic consumption of petroleum products totaled 109,841,000 barrels in the 12 months ending June 30, 1964, an increase of about 12.5 percent over the usage reported for the previous year. While refinery production for the period was slightly greater, indicating self-sufficiency, shortages of certain items, notably motor gasoline and lubricants, called for imports totaling 15 million barrels. Surplus refined products amounting to 14.3 million barrels were exported.

TABLE 6.—Capacity of refineries and lubricating oil plants, as of Dec. 31, 1964

	Annual capacity (thousand metric tons)
Refineries:	
Australian Oil Refining Pty. Ltd.: Kurnell, New South Wales	4,470
Boral Ltd.:	
Matraville, New South Wales	914
Hamilton, Queensland	102
BP Refinery (Kwinana) Pty. Ltd.: Kwinana, Western Australia	4,044
Petroleum Refineries (Australia) Pty. Ltd.:	
Altona, Victoria	2,520
Adelaide, South Australia	1,788
Shell Refining (Australia) Pty. Ltd.:	
Geelong, Victoria	2,540
Clyde, New South Wales	996
Total	17,374
Lubricating oil plants:	
Australian Lubricating Oil Refinery Ltd.: Kurnell, New South Wales	142
BP Refinery (Kwinana) Pty. Ltd.: Kwinana, Western Australia	102
Shell Refining (Australia) Pty. Ltd.: Geelong, Victoria	81
Total	325

Additional refining facilities under construction as of January 1, 1965, included Ampol Refineries Ltd. (40,000 barrels per day) at Lytton, and Amoco Australia Pty. Ltd. (25,000 barrels per day) at Bulwer Island, both in Queensland; and B. P. Refinery (Westernport) Pty. Ltd. (30,000 barrels per day) at Westernport, Victoria.

The Mineral Industry of New Zealand

By Lester G. Morrell[1]

◆

ESTIMATED value of mineral production in New Zealand rose to $59 million[2] in 1964, a 4-percent increase over that of the previous year. The category of nonmetallic mineral products has continued to command a more prominent position in the national mineral industry at the expense of metals and fuels.

As a result of diminishing reserves there has been a steady, continuing decline in output of gold, while production of cement and certain agricultural and construction materials has been expanding. Total value of minerals produced in selected recent years is summarized as follows:

Year	Percent			Total value, millions[1]	
	Metals	Nonmetals	Fuels		
1950	10.8	22.5	66.7	NZ£9.38	$26.07
1955	2.3	54.8	42.9	15.85	44.07
1960	2.2	55.2	42.6	19.90	55.33
1961	1.8	56.6	41.6	19.80	55.07
1962	1.5	59.7	38.8	18.44	51.28
1963	1.0	59.4	39.6	20.33	56.53
1964	0.6	60.9	38.5	21.15	58.79

[1] Exclusive of cement and manufactured fertilizers.

As in previous years, the value of mineral products contributed less than 1.5 percent of the gross national product estimated at $4,448 million for 1964. Employment in mines and quarries during 1964 totaled 7,771, compared with 7,866 for the previous year. Primary mineral industries account for less than 1 percent of the total force. Manufacturing industries and farming occupied 26.4 and 12.5 percent, respectively, according to October 1964 data. Distribution and number of mine and quarry employees, by product categories was as follows for 1961–64:

	1961	1962	1963	1964
Metals, including gold	157	127	117	98
Nonmetals	3,791	3,927	3,977	3,885
Coal	4,044	3,852	3,660	3,631
Petroleum	147	153	112	157
Total	8,139	8,059	7,866	7,771

---

[1] North America-South Pacific specialist, Division of International Activities.

[2] Where necessary values have been converted from New Zealand pounds (NZ£) at the rate of NZ£1=US$2.789.

GOVERNMENT POLICIES AND PROGRAMS

Principal mineral industry developments in 1964 relate to projects in which the Government is involved. Late in December the Provisional Board of the New Zealand Steel Company expressed confidence in the plan to base a domestic steelmaking enterprise on North Island iron sands resources. Estimated initial requirements are for a capital of $48.8 million and a labor force of 850. Construction is to begin in 1965 whereas production of steel is to commence possibly in 1967. The Government has employed three overseas consulting firms to further study the reserve potential and to conduct market and pipeline surveys concerning use of the recently discovered Kapuni natural gas resources.

Government assistance to the mining industry for fiscal year ended March 31, 1965, and totaled $38,873, of which approximately 85 percent was loaned for mine development and construction of access roads. About $5,800 was granted outright to several similar projects. Mining rights and licenses granted in 1964 reflect a moderate decline in prospecting activities compared with the previous year. Grants in 1964 (1963 data in parentheses) included: Mineral claims—12 (23); prospecting licenses—111 (141); water rights—60 (28); mineral licenses—35 (64); and privileges of other types—16 (37).

Of noteworthy interest was the publication early in 1965 of *Economic Geology of New Zealand* by G. L. Williams and the New Zealand Geological Survey. Published by the Australasian Institute of Mining and Metallurgy expressly as volume 4 of the Eighth Commonwealth Mining and Metallurgical Congress, this work assembles and documents a vast amount of published and heretofore unpublished data on the geology and economic minerals of New Zealand.

The Continental Shelf Act 1964, gives the Minister of Mines jurisdiction to grant rights to prospect for and produce petroleum and other minerals on the Continental Shelf. Petroleum Pipeline Regulations 1964 provide for obtaining oil or gasline construction authorizations.

PRODUCTION

Noteworthy increases in output of cement, dolomite, manufactured fertilizers, perlite, pumice, salt, dimension stone, and coal were recorded in 1964. Gold production fell to virtually an alltime low. Coal as well as sand and gravel construction materials, which together account for nearly 88 percent of the total value of New Zealand minerals, increased slightly in 1964.

TABLE 1.—New Zealand: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Copper ore, gross weight	--------	--------	104	234	736
Gold troy ounces	33,326	28,294	21,742	14,206	8,948
Iron ore, gross weight	2,031	1,773	1,525	3,123	2,591
Silver troy ounces	1,353	805	416	286	141
Tungsten ore, gross weight	9	5	8	5	5
Nonmetals:					
Asbestos	289	338	415	398	--------
Bentonite	2,200	1,688	1,512	1,687	1,835
Cement	616,564	651,085	631,000	722,000	787,800
Clay:					
Pottery, etc	6,140	4,703	7,335	7,837	5,961
Structural types	338,083	418,183	321,214	293,859	304,221
Diatomite	6,343	3,593	1,904	1,629	1,706
Dolomite	3,444	3,607	5,840	4,457	9,311
Fertilizers, manufactured superphosphate thousand tons	1,224	1,306	1,249	1,480	1,795
Kauri gum	[e] 145	NA	[e] 44	[e] 44	38
Limestone:					
Agricultural and industrial thousand tons	946	960	901	929	1,247
For cement do	1,108	1,232	1,111	1,206	1,362
Magnesite	808	590	645	794	613
Perlite	354	393	393	573	929
Pumice	44,637	33,237	33,044	16,873	20,847
Salt	17,293	5,098	9,043	11,177	21,674
Sand, rock and gravel thousand tons	16,383	15,988	18,394	20,071	19,900
Serpentine do	144	159	142	[r] 136	137
Silica (glass) sand	63,540	56,122	63,318	[r] 64,844	43,945
Stone, dimension	28,614	16,388	16,270	12,681	20,887
Mineral fuels:					
Coal:					
Anthracite thousand tons	1	(1)	1	(1)	(1)
Bituminous do	812	769	711	671	693
Subbituminous do	2,084	2,044	1,728	1,951	2,071
Lignite do	163	159	151	164	159
Total do	3,060	2,972	2,591	2,786	2,923
Coke:					
High-temperature thousand tons	6	6	6	6	6
Low-temperature do	73	78	88	78	80
Fuel briquets do	15	15	12	13	15
Natural gas million cubic feet	5.3	5.1	4.1	4.6	5.1
Condensate thousand 42-gallon barrels	--------	--------	3.3	3.5	3.5
Petroleum, crude do	5.5	4.4	4.0	4.0	4.1

[e] Estimate.
[r] Revised.
NA Not available.
[1] Less than ½ unit.

TRADE

Following conversion of official trade data to fiscal basis, the accompanying tabulation summarizes transactions for the yearly period July 1, 1962, through June 30, 1963, compared with January to June 1962 and the calendar year 1961.

New Zealand exports of minerals and metals are meager, totaling $2.2 million in value in fiscal year 1962 and consisting mostly of scrap and reexported semimanufactured metals, precious metals, and small quantities of construction materials and manufactured fertilizers. Imported minerals and metals include a wide range of crude, semimanufactured and fabricated products and solid and liquid fuels. The value of mineral product categories compared with value of total imports for 1962–64 is summarized as follows:

Commodity group	Value [1] (million dollars)		
	1962	1963	1964
Mineral fuels	62.2	64.7	66.7
Chemicals and fertilizers	62.5	74.2	84.8
Metals and manufactures	112.4	123.6	134.4
Total mineral products	237.1	262.5	285.9
All other	448.4	563.9	598.2
Total imports	685.5	826.4	884.1

[1] New Zealand Department of Statistics. Monthly Abstract of Statistics. No. 69, May 1965, table 40, p. 36.

TABLE 2.—New Zealand: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962 [1]	1962–63 [2]	Principal destinations, 1962–63
Metals:				
Aluminum scrap	NA	NA	633	Australia 370; United Kingdom 78; Japan 67.
Copper scrap	1,309	377	626	Japan 267; Belgium-Luxembourg 87; Italy 53.
Gold, refined troy ounces	24,056	5,900	[3] 18,300	NA.
Iron and steel:				
Iron ore and concentrate	241	119	13	West Germany 8; Australia 5.
Iron and steel scrap	15,218	2,814	290	Japan 284; United Kingdom 5.
Lead scrap	NA	NA	1,146	Japan 392; Republic of South Africa 225.
Silver and platinum ores. value NZ£ [4]	NA	NA	14,508	United Kingdom 7,434; Australia 6,584.
Tin scrap long tons	NA	NA	5,336	West Germany 2,818; Netherlands 1,969.
Tungsten ore, scheelite	6	2		
Nonmetals:				
Cement	3		6	Mainly to Pitcairn Island.
Fertilizers: Superphosphates	77	58	175	Mainly to Fiji.
Kauri gum	92	18	35	United States 20; United Kingdom 7; Australia 3.
Pumice	1,124	453	231	Australia 225; Fiji 6.
Mineral fuels:				
Coal	13,777	46	10	West Germany 5; Western Samoa 3.
Coke	34	11	15	Tonga 8; Fiji 4; Western Samoa 3.

NA Not available.
[1] 6 months, January through June.
[2] Fiscal period, July 1, 1962, through June 30, 1963.
[3] Estimated, includes gold of domestic and foreign origin as well as coin.
[4] NZ£1 = US$2.79.

TABLE 3.—New Zealand: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962 [1]	1962–63 [2]	Principal sources, 1962–63
Metals:				
Aluminum:				
Ingots, pigs, etc	2,119	1,798	5,207	Canada 3,789; United States 1,191.
Semifabricated	3,024	979	1,554	United Kingdom 545; Canada 504.
Foil	818	419	810	United Kingdom 506; West Germany 112.
Pipes and tubes	219	67	332	United Kingdom 193; Australia 123.
Antimony, metal	165	75	124	U.S.S.R. 81; mainland China 31.
Copper:				
Ingots, pigs	91	45	132	All from United Kingdom.
Semifabricated	3,534	1,589	10,946	Australia 5,291; United Kingdom 3,996.
Wire (including alloys)	3,634	1,875	338	United Kingdom 154; Belgium-Luxembourg 121.
Gold, refined troy ounces	5,256	3,741	10,808	Australia 8,973; United Kingdom 1,526.

See footnotes at end of table.

TABLE 3.—New Zealand: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962[1]	1962–63[2]	Principal sources, 1962–63
Metals—Continued				
Iron and steel:				
Pig iron	9,440	4,166	7,351	All from Australia.
Steel ingots	2,984	4,146	2,679	Australia 2,623; United Kingdom 47.
Ferroalloys	270	216	1,054	Republic of South Africa 908; United Kingdom 41.
Semifabricated	161,521	51,778	267,504	Australia 96,068; Japan 93,695; United Kingdom 85,303.
Lead, metal: Ingots, pigs, etc	5,289	2,460	5,144	Australia 5,122; United Kingdom 21.
Mercury 76-pound flasks	77	19	151	Mexico 69; United Kingdom 35; Spain 34.
Nickel, metal	27	18	29	Mainly from United Kingdom.
Platinum group metals refined. troy ounces	2,884	990	2,925	United Kingdom 2,839; West Germany 74.
Silver, refined do	41,672	50,004	1,842,574	Australia 990,200; United Kingdom 850,078.
Tin, metal long tons	314	205	375	Federation of Malaya 299; United Kingdom 57.
Zinc:				
Ingots, slabs, etc	2,605	1,444	2,768	Australia 2,721; United Kingdom 44.
Semifabricated	741	274	385	Australia 268; United Kingdom 75.
Nonmetals:				
Asbestos, crude	5,271	2,107	7,118	Canada 4,370; Republic of South Africa 2,547.
Barite (barium sulfate)	5,317	860	627	West Germany 529; Australia 66.
Cement, portland	3,857	1,370	2,440	United Kingdom 1,755; Denmark 483.
Clay:				
Ceramic and chemical types	2,785	1,004	NA	
Fire clay	113	16	NA	
Diatomaceous earth	1,523	1,195	909	United States 823; Australia 41.
Feldspar	568	388	2,900	Sweden 2,763; Norway 70.
Fertilizer materials:				
Rock phosphate, crude	615,627	329,598	607,534	Nauru 401,217; French Oceania 112,753.
Basic slag	31,298	17,993	20,460	Belgium-Luxembourg 19,772; West Germany 607.
Other phosphates	8,083	4,884	7,678	Portugal 7,397; West Germany 148.
Ammonium nitrate	5,714	1,493	957	Belgium-Luxembourg 484; West Germany 189.
Ammonium sulfate	8,165	2,549	10,008	Australia 3,934; West Germany 2,301; Netherlands 2,166.
Other nitrates	3,327	2,825	649	West Germany 498; Netherlands 146.
Potassium chloride	132,671	54,704	83,756	West Germany 50,874; United States 19,508.
Fuller's earth	264	76	NA	
Gypsum:				
Crude	77,751	41,199	90,442	Australia 84,801; Cyprus 5,588.
Plaster of paris	16,830	3,285	1,724	West Germany 1,247; United Kingdom 417.
Magnesite	47	224	148	Australia 67; United Kingdom 36.
Salt	54,098	22,366	66,211	Australia 30,561; United Kingdom 26,992.
Sulfur, crude	146,771	57,300	110,424	United States 77,583; Mexico 32,622.
Titanium dioxide pigment	3,631	1,732	3,843	United Kingdom 2,597; Japan 856
Mineral fuels:				
Coal	9,944	4,740	2,953	Mainly from Australia.
Coke	363	12	89	All from United Kingdom.
Bitumen, natural	329	49	647	Trinidad and Tobago 560; Jamaica 77.
Petroleum, refinery products:				
Gasoline thous. 42-gal. bbls	8,681	4,572	8,581	Bahrain 1,493; Indonesia 1,196.
Kerosine and jet fuels do	645	314	653	Australia 229; Netherlands Antilles 108.
Distillate fuel oil do	3,498	2,110	3,028	Australia 1,996; Peru 540.
Residual fuel oil do	1,646	954	2,526	Australia 1,639; Iran 714.
Lubricants do	329	205	295	United Kingdom 182; United States 97.
Asphalt do	454	357	397	Netherlands Antilles 362; Netherlands 24.
Other do	105	67	174	United States 67; Indonesia 67.
Total do	15,358	8,579	15,654	

NA Not available.

[1] 6 months, January through June.

[2] Fiscal period, July 1, 1962, through June 30, 1963.

COMMODITY REVIEW

METALS

Copper.—Production of copper ore for domestic use as a trace-element additive in fertilizers was increased in 1964. As in previous years, the entire output was from the Copper Queen Mine at Parakao and the Hazelbrook Mine near Kaeo in North Auckland. Both are open-pit mines operated by Marriot Industries Ltd.

A copper prospect at Moke Creek near Queenstown in Otago, South Island, was investigated. Discovered some years ago, the deposit is said to be of good grade but too small for commercial operation.

Gold.—The Kanieri Gold Dredging Ltd. operation on the Taramakau River in Westland, South Island, was the source of 8,706 ounces of gold, more than 97 percent of the New Zealand gold output in 1964. Quartz mining yielded 32 ounces and several small alluvial operations had a combined production of 210 ounces. The 1964 output of gold was the lowest in more than a century of continuous production.

The Kanieri (18-cubic-foot bucket dredge) reported an average 0.976 grain recovery per cubic yard from 4,539,000 yards dredged. The operation employed an average of 44 men and an area of about 40 acres was worked to an average depth of 56 feet. Prospecting and development activities were conducted at the Golden Treasure mine at Murray Creek, Reefton, and by the Waikakaho Mines Ltd. at Marlborough.

Iron Ore.—Four small mines near Kamo and Kaeo in North Auckland and a mine at Onekaka near Nelson produced limonite for various local industrial uses including gas purification; iron ore was quarried at Parapara for use by the Golden Bay Cement Co. Ltd.

Although few firm commitments have been announced, studies and plans for the New Zealand Steel Company project are proceeding. The Provisional Board of that company early in 1965 recommended providing for permanent New Zealand control of the operating company and the domestic market. The development program, totaling $156 million would commence production of galvanized sheets, from imported cold-rolled coil, in 1967. Production of steel wirebars from New Zealand iron sands is scheduled to begin in 1968, whereas production of pipe, hot-rolled coil, and tin plate will possibly begin by 1976. A steel output of 600,000 tons per year is envisaged by 1983. The right of the Government to engage in prospecting and mining the coastal iron sands and to participate in the iron and steel industry was authorized by the Iron and Steel Industry Act of October 23, 1959.

Lead and Zinc.—Underground prospecting and development by South Pacific Mines Ltd., in the Tui mine, near Te Aroha Mountain, South Auckland, has revealed a vein of lead and zinc sulfide ore 1,000 feet long and up to 2 feet wide. The company plans to provide a treatment plant. Construction is expected to commence in 1965.

NONMETALS

Asbestos.—With the closure of the Hume Industries (N.Z.) Ltd. operation in 1963, no production of asbestos was recorded in New

Zealand in 1964. Mines Exploration Pty., Ltd. (a subsidiary of Broken Hill South Ltd.), and Cobb Minerals Ltd. (subsidiary of Lime and Marble Ltd.) have joined in a geophysical and exploratory drilling program to determine the extent and reserve potential of asbestos deposits in the Upper Takaka Valley, Golden Bay County, South Island.

Bentonite and Other Clays.—Prospecting and laboratory testing of the nonswelling bentonite occurrences near Colgate and Hororata, 40 miles west of Christchurch, has been continued. Most of the New Zealand production has been mined at Porangahau and Mangatu on the North Island.

A summary listing and description of many bentonite and clay occurrences in New Zealand was published in 1965.[3]

Drilling by Clay Enterprises Ltd., near Matauri Bay, North Island, has outlined reserves of halloysite clay totaling at least 7 million tons. Further testing of this area and other deposits of kaolin-type clays will be carried out in North Auckland and the Coromandel-Tairua area. These clays will find a ready market in the local pottery as well as ceramics and paper manufacturing industries. An exportable surplus is also anticipated.

Manufacture of clay products was at a high level in 1964. The year's output of selected items, compared with figures for 1963 (in parentheses) were as follows: Glazed pipe—6.3 (5.5) million feet; field tiles—11.3 (10.2) million feet; and hollow tile and bricks 53.2 (48.6) million pieces.

Cement.—Production of cement rose to a new peak in 1964, an increase of nearly 10 percent above the 1963 level. Most of the increase was produced by the Golden Bay Cement Co. Ltd. at Tarakohe, West Coast District, which accounted for 177,290 metric tons, and by the Guardian Cement Co. Ltd. (formerly New Zealand Cement Co. Ltd.), which produced 117,837 tons in 1964. The Wilson (N.Z.) Portland Cement Co. Ltd. recently embarked on a 2-year plant expansion that will increase that company's annual capacity from 200,000 to 500,000 long tons. A conveyor belt to carry 800 long tons of limestone per hour from the quarry crusher to the cement works is included in the expansion plan.

Dolomite.—Production of dolomite was more than double that in 1963. The bulk of New Zealand production continued to be from Mount Burnett, Collingwood. In addition to supply domestic agricultural requirements, dolomite from this source was replacing imported raw material for the Whangarei Window Glass factory at Whangarei. The dolomite for glass manufacture was processed in a new plant near Collingwood jointly owned by Lime and Marble Ltd. and Golden Bay Distributors Ltd.

Fertilizers.—Responding to a rapidly increasing demand for fertilizers of all types, domestic production of superphosphates as well as imports of raw materials and manufactured fertilizers have risen sharply in recent years. Supplementing the traditional Nauru, Ocean Island, and Makatea sources, the British Phosphate Commission has arranged to import 160,000 tons of rock phosphate from United States during the year ending June 30, 1965. The emphasis on increased agricultural yields and tax incentives is reflected in forecasts by the Agricultural Development Conference to the effect that expenditures on fertilizer materials will quadruple during the 1964–80 period. The Aviation Industry Association anticipates an increase in aerial top-dressing from 700,000 tons annually in 1964–65 to more than 1 million tons in 1970. Annual production capacity of New Zealand's fertilizer plants as of May 1964 and as planned are given in the following table:

---

[3] Fieldes, M., and others. Clays. Ch. in Economic Geology of New Zealand. Australasian Inst. Min. and Met., Eighth Commonwealth Min. and Met. Congress, v. 4, 1965, pp. 337–376.

Company and plant location	Annual capacity, thousand long tons		Remarks
	May 1964	Planned	
North Island:			
Bay of Plenty Co-op Fertiliser Co., Ltd.: Mount Maunganui.	140	160	Beginning in 1966–67, expandable to 250,000 tons as demand warrants.
East Coast Farmers Fertiliser Co., Ltd.: Napier.	230	265	Beginning in 1965, expandable to 345,000 tons late in 1966.
Kempthorne Prosser & Co.'s N.Z. Drug Co., Ltd.:			
Wanganui	135	165	Beginning in 1965.
Westfield	110	150	Do.
Kempthorne Prosser & Co.'s N.Z. Drug Co., Ltd., and New Zealand Farmers Fertilizer Co., Ltd.: Wellington.	---	140	Beginning in 1968.
Kiwi Fertiliser Co., Ltd.: Morrinsville	140	150	As of June 1964.
New Zealand Farmers Fertilizer Co., Ltd.:			
New Plymouth	160	280	Beginning in November 1965.
Otahuhu and Te Papa	270	430	Beginning in July 1966.
Northland Fertilizer Co., Ltd: Whangarei	---	140	As of November 1964.
South Island:			
Dominion Fertiliser Co., Ltd.: Burnside and Ravensbourne.	165	200	Beginning in 1965.
Kempthorne Prosser & Co.'s N.Z. Drug Co., Ltd.: Hornby.	140	175	Do.
Southland Co-operative Phosphate Co., Ltd.: Awarua.	140	250	Beginning in 1966–67.

Source: Bureau of Mines. Mineral Trade Notes. V. 60, No. 3, March 1965, p. 18.

MINERAL FUELS

Coal.—In 1964 production of coal increased 5 percent above the tonnage produced in 1963. The bulk of the increase was from the Waikato and Taranaki fields on the North Island. A total of 136 coal mines were operated during the year. Of these, the 89 state-owned mines (including 6 owned jointly with private interests) accounted for 58 percent of the total output. Underground mines produced nearly 1.7 million metric tons, 57.4 percent of the total, and for the first time in 7 years these mines showed a reversal in the downtrend of underground production. Basic industrial statistics and sources of New Zealand coal production, by coalfields, are summarized in the following table:

	1961	1962	1963	1964
Strip mines:				
Output thousand metric tons	1, 129	867	1, 138	1, 245
Employees	412	418	364	449
Tons per man year	2, 740	2, 075	3, 126	2, 772
Underground mines:				
Output thousand metric tons	1, 843	1, 724	1, 648	1, 678
Employees	3, 632	3, 434	3, 296	3, 182
Tons per man year	507	502	500	527
Total all mines:				
Output thousand metric tons	2, 972	2, 591	2, 786	2, 923
Employees	4, 044	3, 852	3, 660	3, 631
Tons per man year	735	673	761	805
Production by coalfield:				
North Auckland thousand metric tons	3	3	3	2
Waikato and Taranaki do	1, 526	1, 257	1, 426	1, 536
Nelson do	22	18	18	18
Buller do	302	287	262	271
Reefton do	108	107	110	108
Grey do	470	423	405	419
Canterbury do	21	19	18	18
Otago do	119	122	135	135
Southland do	401	355	409	416
Total do	2, 972	2, 591	2, 786	2, 923

Consumption of coal in 1962, the latest year for which data are available,[4] was by the following users (in metric tons): Household—477,500; electric power generation—347,500; dairy and meat industries—419,600; gasworks—266,200; railways—190,000; cement plants—189,000; pulp and paper mills—124,000; miscellaneous manufacturing—206,300; and all other uses—254,000.

Coke and Briquets.—During 1964, the Smokeless Fuel Co. Ltd. at Sockburn produced 6,455 metric tons of hard coke. Public utility companies reported a total output of 80,000 metric tons of low temperature coke for the fiscal period 1963–64.

Waikato Carbonisation Ltd., the low-temperature works at Rotowaro, carbonized 28,400 tons of raw coal and purchased 13,900 tons of low temperature coke to produce 14,926 metric tons of briquets in 1964. At Ngakawau, near Cape Foulwind, South Island, the State Coal Mines has provided a new briquet works that commenced production during the year.

Petroleum and Natural Gas.—Production of petroleum in 1964 was limited to 4,064 barrels from four wells of Edgemont Oil Wells Ltd. at New Plymouth and 3,527 barrels of condensate from the Kapuni field. The company also supplied 5.08 million cubic feet of natural gas to the New Plymouth Gasworks.

The natural gas and condensate resource was found in 1959 at Kapuni. The Kapuni field, ready for production, is the subject of utilization studies that are being conducted by three oversea consulting firms. Daily potential of the field is estimated at 60 million cubic feet of gas (47½ percent CO_2, 41 percent methane, 10 percent higher hydrocarbons) and 4,500 barrels of light oil for 25 to 30 years.

Drilling and exploration activities were at a relatively high level throughout 1964. Seven wells with a total depth of 31,812 feet were completed and two were incomplete at the end of the year. All wells, including the two completed in January 1965, were dry. Details of the completed wells are given in table 4. Four geological-geophysical crews were active during the year. Areas investigated included both coasts of the North Island, the Golden Bay region, and Southland of South Island. The Mines Department reported 331 petroleum prospecting licenses totaling 54,669 square miles in force as of December 31, 1964. Several Continental Shelf prospecting concessions were applied for under the newly enacted Continental Shelf Act of 1964.

---

[4] Department of Statistics. New Zealand Official Yearbook 1964. Wellington, 1964, p. 486.

The New Zealand Refining Co. Ltd. refinery, New Zealand's first, was opened at Marsden Point on May 30, 1964. Ownership is 40 percent by the public and 60 percent by Shell, Mobil, Caltex, and British Petroleum. With a capacity of 54,000 barrels per day, the refinery has been designed to meet domestic demand for gasoline, gas oil, diesel fuel, fuel oil, and asphalt.

TABLE 4.—New Zealand: Wells completed in 1964

Company and location	Well	Total depth (feet)
North Island:		
N.Z. Petroleum Exploration Co. Ltd.: Hamilton basin	Te Rapa No. 1	5,525
Champlin Oil and Refining Co.: Rangitikei basin	Santoft No. 1	1,032
Do	Santoft No. 1A	7,560
Shell, British Petroleum and Todd Oil Services Ltd.: Taranaki	Tatu No. 1	2,821
Do	Kiore No. 1	1,586
Shell, British Petroleum and Todd Oil Services Ltd.: Wanganui	Parakino No. 1	7,593
South Island:		
Shell, British Petroleum and Todd Oil Services Ltd.: Westland	Arahura No. 1	5,695

The Mineral Industry of Other South Pacific Islands

By Lester G. Morrell[1]

CONTENTS

	Page		Page
British Solomon Islands	1337	Nauru and Ocean Islands	1341
Christmas Island	1338	New Caledonia	1341
Fiji Islands	1339	New Hebrides	1343
Makatea	1340	Papua and New Guinea	1344

THE WIDELY scattered islands of the South Pacific continued to play an important role in world supplies of nickel, gold, phosphate rock, and manganese ore. In addition, small quantities of byproduct cobalt and silver as well as iron ore and several nonmetallic and construction materials were important to the local economies of certain islands. Continued interest in new prospects, notably of copper and petroleum, was reflected in geological and geophysical studies conducted during 1964 by private mining and oil companies and by various government technological agencies. During the year, the United Nations announced special fund cooperative allocations for airborne geophysical surveys in the Solomon Islands. The South Pacific Commission contributed a token grant to educate Melanesian native drilling apprentices in Fiji.

BRITISH SOLOMON ISLANDS

The 11,500-square-mile area of the six major islands that make up the British Solomon Islands Protectorate (BSIP) has long attracted the attention of economic geologists. However, through yearend 1964, actual production of minerals has been limited to locally used construction materials, small quantities of manganese ore, and a few hundred ounces of gold. For the past 3 years the only recorded mineral production was that of gold, as follows: 1962, 18 troy ounces; 1963, 240 troy ounces; and 1964, 101 troy ounces. Numerous occurrences of the foregoing and other minerals have been reported at widely scattered localities. Interest has been shown in low-grade phosphate deposits, estimated at 8 million tons, on Bellona Island, in deposits of battery-grade manganese ore, on Hanesavo Island (Florida group), and in nickeliferous laterites on San Jorge and Santa Isabel Islands. Several alluvial gold and sulfide copper areas on Guadalcanal have attracted the attention of international mining companies.

---

[1] North America-South Pacific specialist, Division of International Activities.

In 1963 the BSIP Geological Survey Department published the first complete geological map of the protectorate. Incorporating work completed between 1950 and 1962, this constitutes part of the Survey's long-range program to produce detailed geological maps and accompanying reports on the whole country. A gravity survey of the island group was completed in 1964 by the BSIP Government in cooperation with the U.S. National Science Foundation, Army Map Service, and University of Wisconsin. An internationally sponsored gravity-magnetic bathymetric survey of the surrounding seas, in which the Royal Navy is to participate, is scheduled for 1965. A geochemical prospecting project conducted under the auspices of the Royal School of Mines delineated two copper-bearing areas in western Guadalcanal in 1963. The sampling of nickel laterites on Santa Isabel and San Jorge, initiated by the Geological Survey, was taken over in 1964 and continued by Southern Mining and Development Co. (subsidiary of International Nickel Co. of Canada). Conzinc Riotinto of Australia, Ltd. applied for a prospecting license for 88 square miles on Guadalcanal. Eight prospectors' permits, two to oversea applicants, and six to natives, were issued during the year.

An outstanding development was the agreement by the United Nations Special Fund to supply $952,800 against British counterpart funds of $560,000 for an aerogeophysical mineral survey. The flying, assigned to a Swedish company, was to begin in July 1965 and continue through 1967.

CHRISTMAS ISLAND

Christmas Island, a 55-square-mile Australian territory in the Indian Ocean[2] 900 miles northwest of Australia's North West Cape was an important supplier of phosphate rock. The phosphate mining industry is a monopoly of the Christmas Island Phosphate Commission owned jointly and equally by the Governments of Australia and New Zealand. The British Phosphate Commission (BPC) acts as managing agent for the Christmas Island Phosphate Commission. There are three principal phosphate deposits on the island. The largest mine working is at South Point, about 11 miles from the drying plant and port at Flying Fish Cove.

For the past 4 years (ending June 30), exports of phosphate in bulk and phosphate dust in bags were shipped to the following destinations:

Year	Metric tons			
	Australia	Singapore and Malaya	Borneo	Total
1961	604,836	74,744		679,580
1962	630,660	71,765	1,628	704,053
1963	559,599	74,074	3,781	637,454
1964	764,081	67,938		832,019

---

[2] Not to be confused with Christmas Island, near the equator, south of Honolulu.

FIJI ISLANDS

In 1964, the estimated total value of mineral products was $4.7 million (F£1,834,000), nearly 17 percent higher than in 1963. Production of gold and manganese ore was below that of 1963, but the added value of 31,000 tons of cement produced by the new cement plant in Suva more than compensated for these declines and accounted for most of the increase.

In December the Geological Survey Department announced that a 1:500,000-scale geological map of the Fiji Islands had been completed and that it would be published in 1965. Major Government activities, aside from an intensive campaign of geological mapping, included continuation and completion of geophysical studies on the copper-zinc occurrences in the Sambeto Valley and initiation of a cooperative geochemical survey on a large area of Emperor Mining Co. property at Vatukoula.

PRODUCTION

Details of mineral production for the years 1960 through 1964 are given in the accompanying tabulation.

TABLE 1.—Fiji: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Copper ore, 10 percent copper	98	152	130	30	50
Gold troy ounces	72,203	83,417	87,354	107,262	100,493
Iron ore, 55–60 percent iron thousand tons	24	10	6	1	----------
Manganese ore, 40–50 percent MnO_2	11,860	3,510	1,090	3,285	897
Silver troy ounces	31,319	37,712	38,935	46,870	60,564
Nonmetals:					
Cement [1]	----------	----------	----------	NA	30,971
Coral sand cubic yards	NA	NA	19,548	26,032	35,998
Lime	2,898	3,542	2,592	5,438	3,416

[1] Cement plant construction completed in 1962.
NA Not available.

TRADE

The entire output of precious metals and ores of copper, iron, and manganese was for export. Gold-silver bullion traditionally has gone to Australia. In 1963, virtually all ore and concentrate went to Japan. These included 1,247 tons of iron ore and 10,345 tons of manganese ore and concentrate. Mineral and metal imports continued to be dominated by fuels and petroleum products and semimanufactured to fully manufactured nonfuel items. The trade report for 1963 shows 6,653 tons of coal and coke from Australia and 1.03 million barrels of various petroleum products, mostly from Australia and Indonesia. A total of 23,152 tons of manufactured fertilizers was imported, mostly from Japan, and 2,000 tons of salt came from Australia.

COMMODITY REVIEW

Metals.—*Copper.*—Banno Mining Co., Ltd., a subsidiary of Banno and Co., Ltd., of Japan, following about 5 years of prospecting and development, announced plans to begin opencut mining an estimated 3 million tons of 1.5- to 3-percent copper ores on the Undu Peninsula of Vanu Levu Island. The Dowa Mining Co. (Japan) was to supply technical assistance and financing to provide a concentrating plant in 1966 or 1967. The Dowa Mining Co. will get all the output.

Gold.—Emperor Gold Mining Co., Ltd., subsidiary of Emperor Mines, Ltd., of Australia, was the sole source of Fijian gold and silver. One of the colony's principal industries, the mine was not subsidized. It employed about 1,700 workers and supported a native population of about 6,000. For the year ended June 10, 1964, the company reported a record recovery of 101,599 ounces of gold from 280,441 long tons of ore milled. Measured ore reserves were estimated at 861,000 tons averaging 8.7 pennyweights per ton (equivalent to 0.39 ounce per short ton). Recent improvements in metallurgical practices have resulted in a 91.3-percent gold recovery. Research at the plant has developed techniques for separation and recovery of the tellurium content of the ore.

The geochemical prospecting project, which will be carried out in cooperation with the Geological Survey Department, will cover over 100 square miles. Approximately 30,000 soil samples and analyses for arsenic, the control, are anticipated.

MAKATEA

Of the widely scattered islands that comprise French Polynesia, only Makatea, 140 miles north of Tahiti, is important as a source of minerals. Exploitation of rich phosphate deposits on Makatea by Compagnie Française des Phosphates de l'Oceanie (CFPO) is the principal industrial activity and generally accounts for 35 to 40 percent of the total value of exports from French Polynesia. Copra, vanilla, and other agricultural products make up most of the balance.

The phosphate sands, which represent the great bulk of production are said to average 80 to 85 percent tricalcium phosphate. Output, virtually all of which is exported, has averaged about 335,000 tons annually since 1957, when improvements were provided in mining, transportation, and loading facilities. Quantities and principal destinations of recent exports follow:

Year	Metric tons			
	Japan	New Zealand	Other countries	Total
1961	236,358	121,756	10,670	368,784
1962	219,637	87,900	14,054	321,591
1963	194,531	120,198	6,518	321,247
1964	171,424	195,585	7,108	374,117

In September 1962, the remaining minable reserve of phosphates on Makatea was estimated at about 1.4 million tons. Accordingly, the phosphate-mining operation is expected to terminate in 1966. Since 1962 CFPO has initiated production of manganese ore on the New Hebrides Island of Vate and has transferred some personnel and equipment to that operation.

NAURU AND OCEAN ISLANDS

The tiny islands of Nauru and Ocean, just south of the equator and 190 miles apart astride the 168° E. meridian, are the principal South Pacific sources of rock phosphate. The economy of both islands is based entirely on the mining operations of the British Phosphate Commissioners (BPC), an organization capitalized by the Governments of the United Kingdom (42 percent), Australia (42 percent), and New Zealand (16 percent).

Nauru, the larger of the two islands, has an area of 5,263 acres, of which 3,430 acres was estimated by BPC (June 30, 1964), to contain about 65.3 million tons (wet) of phosphate rock averaging approximately 37 percent phosphorous pentoxide.

Ocean Island, with a land area of only 1,500 acres, contains deposits of exceptionally pure phosphate. At the current rate of extraction, reserves on Ocean Island are said to be sufficient for about 20 years.

Exports from both islands are almost exclusively to Australia and New Zealand, with smaller quantities to United Kingdom. Total quantities exported during 1961–64 follow:

Year [1]	Metric tons		
	Nauru	Ocean	Total
1961	1, 360, 167	316, 226	1, 676, 393
1962	1, 574, 496	308, 981	1, 883, 477
1963	1, 632, 208	325, 407	1, 957, 615
1964	1, 679, 622	323, 967	2, 003, 589

[1] Year ending June 30.

NEW CALEDONIA

Greatly increased output of nickel ores and smelter products by Société le Nickel accounted for record mineral output in 1964. Ores and smelter products exported from New Caledonia during the year were valued at $55.2 million, compared with $44.4 million in 1963. These products comprised nearly 90 percent of the country's total exports, which were estimated at $62.3 million in 1964.

After nearly 60 years of activity, the Tiebaghi chromite mine at Paagoumene, on the northwest end of the island, was shut down in 1964. No production was reported either in 1963 or 1964. Chromite exports reported in 1964 were all from accumulated stocks.

The French Government organization, Bureau de Recherches Géologiques et Minières (Bureau of Geological and Mining Research), which has been working since 1952 in New Caledonia, Tahiti, and many other French Pacific regions, ceased activities in 1964.

PRODUCTION

In 1964 production of nickel in ore increased 30 percent and nickel-cobalt content of smelter products increased 18 percent, compared with the 1963 figures. After a period of apparent inactivity, production of giobertite, the magnesium carbonate used locally as a metallurgical refractory, was resumed.

TABLE 2.—New Caledonia: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1960	1961	1962	1963	1964
Metals:					
Chromite (51 to 53 percent chromium oxide)	39, 160	36, 662	15, 455	----------	----------
Iron ore (55 to 56 percent iron)..thousand tons..	276	277	303	299	292
Nickel:					
Ore [1] (3.0 to 3.1 percent nickel)........do....	2, 274	2, 310	1, 458	1, 931	2, 576
Metal in ore	53, 500	53, 300	34, 000	44, 500	58, 153
Metallurgical products: [2]					
Ferronickel (nickel-cobalt content)	11, 440	13, 367	5, 506	8, 332	13, 330
Matte (nickel-cobalt content)	10, 429	12, 034	9, 858	14, 146	13, 298
Total (nickel-cobalt content)	21, 869	25, 401	15, 364	22, 478	26, 628
Nonmetals: Giobertite [3]	----------	----------	1, 176	12	1, 007

[1] Mine-run ore, about 25 percent water, nickel content by dry analysis.
[2] Ferronickel grading 24 to 28 percent nickel-cobalt, mattes about 79 percent nickel-cobalt.
Magnesian mineral used for refractories.

Source: Mines Service of New Caledonia.

TRADE

In the past, the entire output of metallic ores and smelter products has been exported. France has been the traditional destination of the great bulk of nickel smelter products; however, large quantities of matte have been exported to Japan and Canada for refining. Quantities and destinations of mineral exports in 1964 are shown in table 3.

Fuels, including coal, coke, briquets, and petroleum refinery products, were by far the dominant class of mineral imports in 1962 and 1963. They came mostly from Australia and Indonesia. Cement, gypsum, and other construction materials also were imported in relatively large quantities. Total mineral imports were valued at about $8.8 million in 1963, almost the same as in 1962. They accounted for 23 percent of total imports in 1963, compared with 21.4 percent in 1962.

TABLE 3.—New Caledonia: Exports of metals and minerals

(Metric tons)

Commodity	1962	1963	1964	Principal destinations, 1964
Chromite	15, 009	17, 955	5, 994	All to Japan.
Iron ore	282, 202	294, 148	292, 480	All to Australia.
Nickel ore	596, 008	639, 913	1, 098, 861	All to Japan except 592 to France.
Smelter products: [1]				
Ferronickel:				
Electric grade (FN4 grade—25.1 percent nickel-cobalt)	1, 219	1, 704	2, 473	France 2, 237.
Sulfur extracted (FN3 grade—24.5 percent nickel-cobalt)	203	552	1, 850	All to France.
Refined (FN2 grade—26.3 percent nickel-cobalt)	42	141	167	Do.
Overrefined (FN1 grade—27.5 percent nickel-cobalt)	3, 677	5, 759	8, 378	France 5,792.
Matte: Nickel matte (79 percent nickel-cobalt)	9, 025	14, 129	13, 485	France 5,814; Japan [2] 5,338.

[1] Data in terms of contained nickel plus cobalt.
[2] Imports reported in Japanese trade statistics.

Source: Mines Service of New Caledonia.

TABLE 4.—New Caledonia: Imports of metals and minerals

(Metric tons)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Iron and steel, semimanufactures	13, 368	7, 863	France 6,099; Australia 1,382.
Nonferrous metals, not further described.	229	189	France 136; Australia 46.
Nonmetals:			
Cement, lime, dimension stone, and asbestos cement products.	20, 392	21, 905	France 14,574; Japan 4,452; Belgium-Luxembourg 2,257.
Fertilizers, processed	183	251	France 210.
Sand, gravel, and crushed rock	44	24, 326	Mexico 24,269.
Other nonmetals	529	603	France 395; West Germany 61; Australia 47.
Mineral fuels:			
Coal, coke, and briquets	150, 952	173, 508	Australia 137,752; West Germany 35,756.
Petroleum products	91, 448	135, 119	Australia 92,404; Indonesia 33,349; Iran 8,947.
Gas, natural and manufactured	827	986	France 237; United States 128.

COMMODITY REVIEW

Metals.—*Iron Ore.*—The export destination of iron ore produced in 1964 by Société Caledonienne de Mineral de Fer (SOCAMIFER), a subsidiary of Société le Nickel, was to the Broken Hill Pty. Co., Ltd. in New Castle, Australia. Average analysis of 15 shipments during the first half of the year follows: Iron 56.1 percent; chromium 3 percent; nickel 0.22 percent; moisture 7.8 percent.

Nickel.—Production of nickel ores in New Caledonia in 1964 totaled 2,575,991 tons, a record and 33 percent above the 1963 figure. The Société le Nickel mines accounted for 1.77 million tons, a record for the company's mining operations.

Principal developments during the year concerned the Société le Nickel modernization and expansion program. Work continued on the preparation for increasing output from the Poro mine and eventual closure of the Kouaoua mine. Facilities for transportation of ore to ports are being improved, and the company's fleet of three 5,000- to 7,000-ton-capacity ore carriers will be supplemented in 1966 and 1967 by two new 15,000-ton (deadweight) ships, which are under construction in Japan. Construction of the new blast furnace and converters was completed, and work continued on a new 32,000-kilowatt diesel powerplant.

Nickel ores exported during 1963 were produced from 40 mines, including 3 operated by Société le Nickel. Corresponding data are not available for 1964.

NEW HEBRIDES

An Anglo-French Condominium governs the 80 or more islands, totaling 5,700 square miles, that comprise the New Hebrides group. Geological studies in the islands have consisted of superficial prospecting by a few private French companies and, beginning in 1955, of surveys conducted jointly by the Bureau de Recherches Géologiques et Minières with CFPO. In 1959, a concession to the manganese ore deposit at Forari, on the east coast of Vate Island, was granted to

CFPO. The concession was for 25 years and covered 4,090 hectares. Production of manganese ore began in 1961, and export shipments began in January 1962. The open pit mine, located a few kilometers from the shore, has been worked with bulldozers and mechanical shovels. Fifteen-ton-capacity trucks have been used to transport the ore about 5 kilometers to the treatment plant, which consists of a washery and Dwight-Lloyd type sintering (agglomeration) plant. The process beneficiates run-of-mine ore containing 30 to 45 percent manganese to a metallurgical-grade product containing 53 to 55 percent manganese, 6.0 to 6.5 percent alumina, 5.5 to 6 percent silica, and 3 to 3.5 percent iron. From storage sheds of 12,000-ton capacity, the ore is loaded directly into ships by a system of belt conveyors capable of handling 600 tons per hour. The mine and treatment plant employs about 250 workers.

Quantity of manganese ore in reserve has not been reported; however, the deposit being worked in 1964 was said to have a potential life of 20 years, and other undeveloped ore bodies are known to exist.

Manganese ore production and exports during the past 4 years follow:

Year	Metric tons	
	Production	Exports
1961	4,590	------------
1962	19,830	14,181
1963	25,416	23,319
1964	60,546	66,104

In 1962 and 1963 all exports went to Japan. Details for 1964 are not available. While Japan will doubtless remain the principal destination, Australia's steel industry is also regarded as a future market for New Hebrides manganese.

PAPUA AND NEW GUINEA

The jointly administered Australian Territories of Papua and New Guinea, which occupy the eastern half of the island of New Guinea and smaller islands of the Bismarck Archipelago, have been only partially explored. However, minerals known to occur include gold, silver, platinum, copper, lead, zinc, nickel, iron, manganese, chromite, gem stones and coal. Oil seeps are known in the northwest coastal areas, and petroleum search studies have been conducted in western Papua. Only gold has been of economic significance, although copper deposits near Port Moresby and manganese occurrences in central Papua have been worked in some past years. Numerous lode and alluvial gold deposits in widely scattered localities have been worked by natives. Large-scale production of gold began about 1930 with the dredging of rich alluvial deposits in the Morobe District.

The value of minerals produced in the two territories in 1964 totaled $1,393,129, compared with $1,555,402 in 1963. Virtually all of these were exported to Australia. For the fiscal year ending June 30, 1963, gold, valued at $1.50 million, comprised 4 percent of the $36.67 million value of total exports. Mineral imports consisting of fuels, lubricants, and related materials amounted to $3.35 million of the total $63.94 million. Summary features for recent years relative to the minerals industry are officially recorded as follows:

Fiscal year	Mineral areas held (acres)	Number of mines	Number of workers	Value of minerals (US dollars)
1960–61:				
Papua	1,019	18	787	7,623
New Guinea	9,971	275	3,925	1,526,105
1961–62:				
Papua	1,038	17	161	968
New Guinea	11,216	300	3,819	1,501,288
1962–63:				
Papua	976	18	345	1,667
New Guinea	11,260	330	3,606	1,493,603

The Territorial Department of Lands, Surveys and Mines administers mining through a Division of Mines, which works in cooperation with the Geological Branch. The latter is staffed by the Australian Bureau of Mineral Resources. Territorial laws govern mining and petroleum prospecting, development, and exploitation. Provision is made for the administration to conduct operations and to render technical and financial assistance to the mining industry. Exploratory drilling totaling 2,464 feet was completed during the year by the administration, at Wau, Edie Creek, Markham Valley (Morobe District), and Kainantu in the eastern highlands.

New legislation proposed during the year included the Pioneer Industries Ordinance which, if adopted, will provide tax exemption to new industries for 5 years. It is hoped that with existing tariff concessions, this will encourage Australian and other investors to establish industries in the territory.

PRODUCTION

Quantities of minerals produced commercially in recent years follow:

Commodity	1961	1962	1963	1964
Gold troy ounces	41,820	39,052	43,599	38,977
Silver do	30,246	24,511	23,696	23,206
Platinum do	5	4	5	1
Manganese ore metric tons	2	------------	3	2

COMMODITY REVIEW

Metals.—*Copper.*—On Bougainville Island (northwestern end of the Solomons) a large body of low-grade disseminated copper in the Crown Prince Range has been studied by an exploration team of Conzinc Riotinto of Australia, Ltd.

Gold.—For the company year ending May 31, 1964, Bulolo Gold Dredging, Ltd., New Guinea's largest gold producer, reported recovery of 18,119 ounces of gold and 8,187 ounces of silver from 3.9 million cubic yards dredged and 1.6 million cubic yards sluiced in the Bulolo Valley of eastern New Guinea. Only one dredge has been working in this area since 1958. At yearend reserves were estimated by the company at 10 million yards thus anticipating only 2 years' further operation. Lode mining on a small scale at Wau, Edie Creek, and Kainantu, also in the Morobe District, yielded 11,417 ounces in 1963–64, compared with 10,228 ounces in the previous year. Production of gold by native miners in Morobe, the eastern highlands, Sepik, and the western highlands totaled 7,955 ounces in 1963–64, compared with 7,057 ounces in 1962–63.

Several companies are investigating gold occurrences on Misima Island in the Milne Bay District, Papua, and in the central and western highlands.

Mineral Fuels.—*Petroleum.*—Despite nearly 50 years of exploration and expenditure of over A£35 million ($78.4 million), no commercial quantities of oil have been found in Papua-New Guinea. Recently the search has been confined to Papua. Since December 1962, Oil Search, Ltd., an Australian company, has been conducting a systematic survey and completed two test wells, both dry, in its 24,608-square-mile concession in the Orinono-Fly River area of western Papua. Marathon Oil Co. with Amerada Petroleum Corp. and Continental Oil Co. employed United Geophysical Co. on a seismic survey, which began in mid-1964 on an 8,600-square-mile concession on the east coast. Phillips Petroleum Pty., Sunray DX Oil Co., Anacapa Corporation, and Tasman Oil Pty. Ltd. have combined in a seismic survey on an 18,130-square-mile offshore concession in the Gulf of Papua.

INDEX

This index to political and geographic areas is not complete; space does not permit complete indexing of countries listed as trading partners in the section of each chapter dealing with trade and in tables accompanying such sections. Moreover it does not list passing mentions of the nationality of business enterprises or Government agencies where these differ from the nationality of the subject country of the chapter.

Direct references to pages appear under the version of the country or area name used in the chapter or chapter section dealing with that country or area (usually but not always the short form of the name approved by the Department of State [1]). Commonly used variations of these names, including names that have recently been changed, are listed with a cross-reference to the version of the particular country or area name used in this volume.

Boldface type has been used to indicate the pages of the chapter or chapter section dealing primarily with the indexed country or area; page numbers in regular type indicate specific mention of the country or area appearing in chapters or chapter sections other than the one dealing primarily with that country or area.

Page

Abu Dhabi 1024, **1101–1103**
Aden Colony 1024, **1104**
Aden Protectorates (East and West) **1104**
Afghanistan 1109, 1110, **1111–1114**
Ajman **1101, 1103**
Albania 326, 341, 344, **345–348**
Algeria 333, 752, 756, **759–765**
Angola 752, **767–773**
Antilles, Netherlands. *See* Netherlands Antilles.
Arabia, Federation of South. *See* South Arabia, Federation of.
Arabia, Saudi. *See* Saudi Arabia.
Argentina 37, 44–47, **149–164**
Aruba. *See* Netherlands Antilles.
Australia 1297–1299, **1303–1326**
Austria 326, 331, 332, 340, **349–361**
Bahrain 1024, **1027–1029**
Basutoland **781**
Bechuanaland **781–784**
Belgium 326, 329, 331, 336, **363–386**, 621, 788
Bhutan 1109
Bolivia 37, 45, 46, **165–179**
Bonaire. *See* Netherlands Antilles.
Brazil 37, 44–47, **181–202**, 337
Britain, Great. *See* United Kingdom.
British Antilles 46
British Guiana 37, 45, **203–209**
British High Commission Territories in Africa **781–786**
British Honduras 47, **65–66**
British Solomon Islands 1297, **1337–1338**
Brunei, Independent Sultanate of 1152, **1231, 1233, 1241–1242**
Bulgaria 326, 341, 344, **387–393**
Burma 1150, 1152, **1159–1164**
Burundi **979–980**
Cambodia 1150, **1279–1282**
Cameroon 748, **980–984**

---

[1] U.S. Department of State, Bureau of Intelligence and Research. Status of the World's Nations. Geographic Bull. 2, Government Printing Office, May 1965, 21 pp.

Page
Canada 1–5, **7–31**
Central African Republic **984–988**
Ceylon 1109, 1110, **1115–1119**
Chad **988–991**
Chile 37, 44–47, **211–240**
China, Mainland 1149, 1150, 1156, 1157, **1165–1180**
China, Nationalist. *See* Taiwan.
Christmas Island [2] **1338**
Colombia 44–47, **241–257**
Congo, Republic of (Brazzaville) 747, 749, 752, **991–996**
Congo, Republic of the (Kinshasha). *See* Congo, Republic of the (Léopoldville).
Congo, Republic of the (Léopoldville) 749, 757, **787–796**
Costa Rica 44, 47, **66–72**
Cuba 46, **103–109**
Curacao. *See* Netherlands Antilles.
Cyprus **1031–1034**
Czechoslovakia 108, 326, 341, 342, 344, **395–400**
Dahomey **997–998**
Denmark 326, 329, 340, **401–407**
Dhofar **1103–1104**
Dominican Republic 46, **109–118**
Dubai **1101, 1103**
East Germany. *See* Germany, East.
Ecuador 46, 47, **301–305**
Eire. *See* Ireland.
El Salvador 44, 46, 47, **72–79**
Ethiopia **797–801**
Fiji Islands 1297, **1339–1340**
Finland 326, 340, **409–420**
France 326, 329–331, 336, **421–469**, 763
French Antilles 46
French Guiana 46, **305–310**
French Somaliland **999**
Fujairah **1101, 1103**
Gabon 752, **803–807**
Gambia **999**
Germany, East 326, 341, 342, 344, **471–476**
Germany, Federal Republic of 326, 328, 331, 332, 336, 337, 407, **477–510**
Germany, West. *See* Germany, Federal Republic of.
Ghana 748, 757, **809–816**
Great Britain. *See* United Kingdom.
Greece 326, 333, **511–518**
Greenland **33–35**
Guatemala 44, 46, 47, **79–84**
Guiana, British. *See* British Guiana.
Guiana, French. *See* French Guiana.
Guinea 748, 749, 757, **817–821**
Guinea, Portuguese. *See* Portuguese Guinea.
Guyane Francaise. *See* French Guiana.
Haiti 45, 46, **118–123**
Hashemite Kingdom of Jordan. *See* Jordan.
Haute Volta. *See* Upper Volta.
Honduras 44, 47, **84–89**
Honduras, British. *See* British Honduras.
Hong Kong 1154–1156, **1282–1285**
Hungary 326, 341, 342, 344, **519–525**
Iceland 333
India 563, 1035, 1109, 1110, **1121–1138**
Indonesia 1151, **1181–1188**
Iran 563, 1023, 1024, 1025, **1035–1044**
Iraq 1023, 1024, **1045–1050**
Ireland 326, 333, **527–533**
Israel 1024, 1025, **1051–1056**

---

[2] The Australian possession in the Indian Ocean, not to be confused with the British possession in the Pacific in the Line Island group.

Page

Italy 326, 328–331, **535–565**
Ivory Coast **823–828**
Jamaica 37, 44–46, **123–133**
Japan 753, 754, 756, 1149–1151, 1153–1155, **1189–1211,** 1300
Jordan 966, 1024, **1057–1060**
Kenya 829, **830–835**
Korea, North 1150, 1157, 1158, **1213–1220**
Korea, Republic of. *See* Korea, South.
Korea, South 1149, 1150, 1154, 1155, **1221–1230**
Kuwait 1023, 1024, **1061–1065,** 1067
Kuwait-Saudi Arabia Neutral Zone 1024, 1061, **1067–1069,** 1071
Laos 1150, **1285–1287**
Liberia 337, **845–852**
Libya 752, **853–858**
Luxembourg 326, 329, 363, 365–373, **567–573**
Madagascar. *See* Malagasy Republic.
Makatea **1340**
Malagasy Republic 747, **859–865**
Malawi 776, **887–890, 904–905**
Malaya. *See* Malaysia.
Malaysia 1050–1052, **1231–1242**
Mali **999–1001**
Mauritania 337, **1001–1005**
Mexico 37, 44–47, **49–64**
Mongolia 1158, **1243–1246**
Morocco 752, 756, **867–877,** 966
Mozambique 774–780
Muscat and Oman 1023, **1103–1104**
Nauru and Ocean Islands **1341**
Nepal 1109
Netherlands 326, 330, 332, 336, 337, 506, **575–594**
Netherlands Antilles 37, 45, **133–140**
Neutral Zone, Kuwait-Saudi Arabia. *See* Kuwait-Saudi Arabia Neutral Zone.
New Caledonia 1297, 1298, **1341–1343**
New Guinea and Papua. *See* Papua and New Guinea.
New Herbrides **1343–1344**
New Zealand 1297, **1327–1336**
Nicaragua 44, 47, **89–94**
Niger **1005–1009**
Nigeria 752, 756, **879–886**
Northern Rhodesia. *See* Zambia.
North Korea. *See* Korea, North.
North Viet-Nam. *See* Viet-Nam, North.
Norway 326, 340, **595–610**
Nyasaland. *See* Malawi.
Ocean Island. *See* Nauru and Ocean Island.
Oman. *See* Muscat and Oman.
Pakistan 563, 1109, 1110, **1139–1148**
Panama 47, **94–102**
Papua and New Guinea 1297, **1344–1346**
Paraguay 46, 47, **310–315**
Peru 37, 44–47, **259–274**, 337
Philippines 1150, 1151, 1153, **1247–1256**
Poland 326, 341, 342, 344, **611–619**
Portugal 326, **621–630**, 767, 774
Portuguese Guinea **780**
Qatar 1023, 1024, **1099–1101**
Ras-al Khaimah **1101, 1103**
Rhodesia, Northern. *See* Zambia.
Rhodesia, Southern 747, 749, 752, 756, 776, **887–897**
Ruanda-Urundi. *See* Rwanda and Burundi.
Rumania 326, 328, 341, 344, **631–637**
Russia. *See* U.S.S.R.
Rwanda **1009–1011**

Page
Sabah. *See* Malaysia.
Sahara, Spanish. *See* Spanish Sahara.
Sarawak. *See* Malaysia.
Saudi Arabia 1023, 1024, 1067, **1071–1075**
Saudi Arabia-Kuwait Neutral Zone. *See* Kuwait-Saudi Arabia Neutral Zone.
Senegal 756, **907–910**
Sharjah **1101, 1103**
Sierra Leone 747, 748, **911–915**
Sikkim 1109
Singapore. *See* Malaysia.
Solomon Islands, British. *See* British Solomon Islands.
Somaliland, French. *See* French Somaliland.
Somali Republic **1011–1014**
South Africa, Republic of 748, 749, 752, 756, 776, **917–942**
South Arabia, Federation of **1104–1106**
Southern Rhodesia. *See* Rhodesia, Southern.
South Korea. *See* Korea, South.
South Viet-Nam. *See* Viet-Nam, South.
South-West Africa, Territory of **943–954**
Soviet Union. *See* U.S.S.R.
Spain 326, 328, 331, 333, **639–657**
Spanish Sahara 640, 654
Sudan **955–959**
Surinam 37, 45, 46, **275–284**
Swaziland 756, **781**, **784–786**
Sweden 326, 331, 337, 340, 621, **659–673**
Switzerland 326, 329–331, 340, **675–686**
Syrian Arab Republic 1024, **1077–1081**
Taiwan 1149, 1153, 1155, **1257–1267**
Tanganyika. *See* Tanzania.
Tanganyika and Zanzibar, United Republic of. *See* Tanzania.
Tanzania 563, 829, **835–840**
Thailand 1150–1152, **1269–1278**
Tobago. *See* Trinidad and Tobago.
Togo **1014–1016**
Trinidad and Tobago 37, 44–46, **140–147**
Trucial Coast. *See* Trucial States.
Trucial States **1101–1103**
Tunisia **961–967**
Turkey 1024, 1025, **1083–1097**
Uganda 829, **840–844**
Umm al-Qaiwain **1101, 1103**
U.S.S.R. 108, 326, 328, 341–343, 523, **687–712**, 859, 1111, 1149
United Arab Republic (Egypt) 749, 752, **969–977**
United Kingdom 326, 329–333, 336, 339, 340, **713–733**, 753, 754, 756, 1300
United States 1–5, 42, 124, 333, 340, 753–755, 1149, 1299–1301
Upper Volta **1017–1020**
Uruguay 46, 47, **315–323**
Venezuela 37, 44, 45, 47, **285–299**, 337
Viet-Nam, North 1149, 1150, 1158, **1288–1292**
Viet-Nam, South 1149, **1292–1295**
Volta, Upper or Haute. *See* Upper Volta.
West Germany. *See*Germany, Federal Republic of.
Yemen **1106–1108**
Yugoslavia 326, 328, 341, 343, 344, **735–746**
Zambia 748, 756, **887–890**, **898–904**
Zanzibar. *See* Tanzania.

UNIVERSITY OF ILLINOIS-URBANA
3 0112 056539312